Proceedings of the Faculty of Economics in East Sarajevo

Journal of Economics and Business

Зборник радова Економског факултета у Источном Сарајеву

Часопис за економију и пословање

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu

Časopis za ekonomiju i poslovanje

Issue 32

2026

ISSN 1840-3557 eISSN 1986-6690

zrefis.ekofis.ues.rs.ba

УНИВЕРЗИТЕТ У ИСТОЧНОМ САРАЈЕВУ
ЕКОНОМСКИ ФАКУЛТЕТ

UNIVERSITY OF EAST SARAJEVO
FACULTY OF ECONOMICS

St. Aleksa Šantić 3, 71420 Pale
Republic of Srpska, BiH
+387 57 226 651 / dekanat@ekofis.ues.rs.ba

EkonomskiFakultetPale
ekofis.ues

ekofis.ues.rs.ba

Published by:
University of East Sarajevo
Faculty of Economics Pale
Alekse Šantića 3, 71420 Pale
Bosnia and Herzegovina
☏ +387 57 226 651
✉ *dekanat@ekofis.ues.rs.ba*
www.ekofis.ues.rs.ba

Proceedings is issued semiannually.

Article submission, processing and/or publishing fees are not charged.

Printed by:
„Kopikomerc" s.z.r. Istočno Novo Sarajevo

Copies:
100

ISSN: 1840-3557 **e-ISSN:** 1986-6690 **UDC:** 330.1 **COBISS. RS-ID:** 16736262 **COBISS. BH-ID:** 16736262
DOI: *https://doisrpska.nub.rs/index.php/zrefis/issue/archive*

The journal is published with the financial support of the Ministry of Scientific and Technological Development and Higher Education in Government of the Republic of Srpska.

Abstracted and indexed in:

Address of the Editorial Board:
Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
Alekse Šantića 3, 71420 Pale
Bosnia and Herzegovina
☏ +387 57 226 651 ext. 410
✉ *zrefis@ekofis.ues.rs.ba*
www.zrefis.ekofis.ues.rs.ba

PROCEEDINGS OF THE FACULTY OF ECONOMICS IN EAST SARAJEVO

ЗБОРНИК РАДОВА ЕКОНОМСКОГ ФАКУЛТЕТА У ИСТОЧНОМ САРАЈЕВУ
ZBORNIK RADOVA EKONOMSKOG FAKULTETA U ISTOČNOM SARAJEVU

Issue 32
2026

The journal is published with the financial support of
the Ministry of Scientific and Technological Development and Higher Education
in Government of the Republic of Srpska.

Часопис је публикован захваљујући финансијској подршци Министарства за
научнотехнолошки развој и високо образовање у Влади Републике Српске

Editor's note

Dear scientists, readers and colleagues,,

I am delighted to introduce scientific journal „Proceedings of the Faculty of Economics in East Sarajevo" (Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevo) one of the best journals in Republic of Srpska and Bosnia and Herzegovina in the area of economics and business. The journal was, according to the Ministry of Scientific and Technological Development, Higher Education and Information Society Republic of Srpska, won 32 out of a possible 40 points, and thus classified in the first category of scientific journals. The Journal is indexed in ERIH Plus, Bergen, Norway; Sherpa Romeo – JISC, United Kingdom; DOAJ - Directory of Open Access Journals, Hovedstaden, Denmark; ProQuest, Ann Arbor, Michigan, U.S.; Google Scholar; EBSCO Publishing, Ipswich; INDEX COPERNICUS International, Warsaw, Poland; CABELL'S Directories (Cabell's Directories of Publishing Opportunities), Texas, USA; C.E.E.O.L (Central and Eastern European Online Library), Frankfurt am Main, Germany; BASE (BASE – Bielefeld Academic Search Engine), Bielefeld University Library, Germany; JEL (Journal of Economic Literature) / EconLite, (American Economic Association's Electronic Database), Pitsburg, USA; DOI Srpska, Banja Luka; CrossRef, Oxford, United Kingdom.

This issue contains selected articles presented at the Intenational Scientific Conference ''Jahorina business forum'' held at Faculty of Economics Pale on May 26th – 27th, 2026. It is very important to stress out that, besides the appropriate level of quality of scientific papers received, the Editorial Board had an additional criteria in the process of selecting papers. The focus was on papers the content of which could contribute to the theory and practice of local economic development in general.

This issue of the scientific journal brings together five papers that examine important challenges shaping contemporary economies, including green transition, fiscal sustainability, income inequality, climate-related financial risks, and rural resilience. Although different in focus and methodology, the contributions are connected by a common interest in how transitional, emerging, and vulnerable economies adapt to structural changes. The first paper analyzes regional inequalities in the context of Serbia's green transition, showing that vulnerability differs significantly between urban and rural areas and that policy measures should reflect specific territorial characteristics. The second paper examines the relationship between public debt and unemployment in Southeast Europe, confirming that rising indebtedness is positively associated with unemployment and emphasizing the need for balanced fiscal policy. The third contribution explores income gaps between advanced, emerging, and developing economies, pointing to persistent disparities but also to different growth dynamics among country groups. The fourth paper analyzes physical climate risks and banking sector resilience in Montenegro, showing that climate shocks, especially floods, can increase non-performing loans and weaken financial stability. The final paper focuses on agrobiodiversity and rural resilience in Northern Albania, demonstrating that biodiversity, farm culture, rural heritage, and tourism participation can strengthen economic performance and reduce migration pressures.Taken together, these studies show that economic resilience increasingly depends on the ability to connect environmental sustainability, fiscal responsibility, financial stability, territorial

development, and local resources. This issue therefore offers a multidimensional perspective on the development challenges and opportunities facing contemporary economies.

The papers refer to the broad area of economic science, and their main prerequisites are scientific contributions to economic theory and practice. The papers can be of theoretical and methodological-analytical nature, and may include areas ranging from national economic policies to business policy. Manuscripts are written in English language.Needless to say, any papers that you wish to submit, either individually or collaboratively, are much appreciated and will make a substantial contribution to the early development and success of the journal. Best wishes and thank you in advance for your contribution to the scientific journal „Proceedings of the Faculty of Economics in East Sarajevo".

Editor-in-Chief

Dr Nemanja Šarenac
Associate Professor

CONTENTS

ORIGINAL SCIENTIFIC PAPERS

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
UDC: 316.323.6:502.131.1(497.11)
DOI: https://doi.org/10.7251/ZREFIS2632011S
Original scientific paper

Year 2026, Issue 32: 11-21
Received: 28th February 2026
Revised: 16th March 2026
Accepted: 18th March 2026
Published: 23th June 2026

Žaklina Stojanović 0000-0003-2878-9835 ✉ zaklina.stojanovic@ekof.bg.ac.rs
Faculty of Economics and Business, University in Belgrade, Serbia

Sonja Josipović 0000-0002-1091-4143 ✉ sjosipovic@tmf.bg.ac.rs
Faculty of Technology and Metallurgy, University in Belgrade, Serbia

Dejan Molnar 0000-0002-6081-8141 ✉ dejan.molnar@ekof.bg.ac.rs
Faculty of Economics and Business, University in Belgrade, Serbia

GREEN TRANSITION AND REGIONAL INEQUALITIES: AN ANALYSIS OF THE VULNERABILITY OF URBAN AND RURAL REGIONS IN SERBIA

ЗЕЛЕНА ТРАНЗИЦИЈА И РЕГИОНАЛНЕ НЕЈЕДНАКОСТИ: АНАЛИЗА РАЊИВОСТИ УРБАНИХ И РУРАЛНИХ ПОДРУЧЈА У СРБИЈИ

Summary: *The green transition, as a conceptual and strategic approach aimed at decarbonizing national economies, reducing social inequalities, and preserving natural capital, entails numerous economic and social effects in both developed and developing countries. These impacts are particularly pronounced at lower territorial levels, meaning that regions characterized by energy- and carbon-intensive activities, as well as those with lower economic diversification and unfavourable demographic characteristics, face greater vulnerability to the structural changes associated with the green transition. Taking these considerations into account, this paper examines regional inequalities in the context of the green transition in the Republic of Serbia. Its main objective is to assess whether differences in vulnerability exist between more and less developed regions, as well as between urban and rural areas, and to identify the potential drivers of such disparities. The analysis is based on the construction and application of a composite Regional Green Transition Vulnerability Index for Serbia at the NUTS 3 level. The index is developed using Principal Component Analysis (PCA) and draws on sectoral indicators covering energy, housing, transport, mining, agriculture, and tourism for 2023. The findings reveal pronounced territorial disparities and underscore the need to design green transition policies in a way that best reflects identified regional specificities.*
Keywords: *green transition, regional vulnerability, urban regions, rural regions, NUTS 3, Serbia.*
JEL Classification: *R58, O18, Q56*

Резиме: *Зелена транзиција, као концептуални и стратешки приступ усмерен ка декарбонизацији националних економија, смањењу социјалних неједнакости и очувању природног капитала, има за последицу бројне економске и друштвене ефекте како у развијеним, тако и у земљама у развоју. Поменути утицаји посебно су изражени на нижим територијалним нивоима, тако да регионима у којима су заступљене енергетски и карбонски интензивне делатности, као и онима са слабијом економском диверзификацијом и неповољним демогра-фским карактеристикама, прети већа рањивост на промене које са собом доноси зелена транзиција. Имајући све наведено у виду, предмет рада је анализа регионалних неједнакости у контексту зелене транзиције у Републици Србији. Циљ рада је да се утврди постојање разлика у рањивости између развијених и неразвијених региона, односно између урбаних и руралних подручја, те да се идентификују њихови потенцијални узроци. Анализа се заснива на примени композитног Регионалног индекса рањивости на зелену транзицију у Републици Србији на NUTS 3 нивоу. Поменути индикатор је конструисан применом методе главних компоненти (Principal Component Analysis – PCA), на основу секторских показа-теља (енергетика, становање, саобраћај, рударство, пољопривреда и туризам) за 2023. годину. Резултати истраживања указују на присуство значајних територијалних диспа-ритета и упућују на потребу дизајнирања мера у оквиру зелене транзиције на начин који ће одговарати утврђеним регионалним специфичностима.*
Кључне ријечи: *зелена транзиција, регионална рањивост, урбана подручја, рурална подручја, NUTS 3, Србија*
ЈЕЛ касификација: *R58, O18, Q56*

Paper presented at the 15th International Scientific Conference ''Jahorina Business Forum 2026: Regional and Local Development in the Context of Reindustrialization and Green Transition"

INTRODUCTION

One of the greatest challenges facing almost all countries today is the fight against climate change. The prevailing view is that global warming is a direct consequence of anthropogenic influence and the resulting greenhouse gas (GHG) emissions. Therefore, decarbonisation is emerging as an imperative for contemporary society as a whole, with Europe standing out over the last two decades in its efforts to reduce harmful gas emissions and become the first climate-neutral continent (European Commission 2019).

The green transition, that is, the shift towards a cleaner economy and behavioural models more generally, entails a deep structural transformation of production systems, labour markets and spatial patterns of development. In this regard, the expected effects of its implementation go beyond the environmental sphere and extend deeply into socio-economic and spatial relations. The results of recent studies indicate that measures aimed at implementing the green transition do not affect all regions equally; rather, there are substantial differences in the "vulnerability" of different types of areas. It is precisely this uneven resilience to the changes and new circumstances brought about by the green transition that may deepen existing regional inequalities, particularly in territorial units dominated by carbon-intensive activities (Rodríguez-Pose and Bartalucci 2024). Bearing in mind that one of the fundamental objectives of the EU is balanced regional development and the reduction of spatial disparities, there is now a clear understanding that territorial specificities must be taken into account when designing green-transition measures and instruments. Existing differences between urban and rural areas, between developed and lagging regions, as well as between regions with different sectoral structures, point to the need for a territorially sensitive approach (Rodríguez-Pose and Bartalucci 2023; OECD 2025). Analysing these differences is an important first step towards understanding the potential risks and opportunities that the green transition brings at lower territorial levels.

In Serbia, territorial differences between urban and rural areas contribute to regions' varying capacity to absorb the effects of green economic transformation. It is necessary to examine how specific sectoral factors related to energy, mining, agriculture, transport and tourism affect regional vulnerability. This type of analysis points to the possibility of classifying regions according to the type of vulnerability and the potential effects of economic decarbonisation measures.

1. LITERATURE REVIEW

Contemporary literature on the green transition increasingly emphasises its spatial dimension. Lars Coenen, Paul Benneworth, and Bernhard Truffer (2012) note that sustainable transitions are not spatially neutral processes; rather, their effects are strongly conditioned by regional institutional, economic and innovation capacities. A spatial perspective makes it possible to better understand how local specificities influence the dynamics of structural change.

In this regard, Rodríguez-Pose and Bartalucci (2024) indicate that the green transition may generate "territorial discontent" if its costs and benefits are not evenly distributed. Regions with a high concentration of energy-intensive industries, weak diversification of the economic structure and limited innovation capacities face a greater risk of job losses and economic stagnation. These and similar findings warn that the green transition may deepen existing regional disparities.

The institutional framework of the European Union recognises these challenges. The 2021 European Commission report (European Commission 2021) on the impact of the

Year 2026, Issue 32: 11-21
DOI: 10.7251/ZREFIS2632011S

European Green Deal emphasises that climate and energy policies have different effects depending on the regional structure of employment, energy dependence and the level of economic development. In addition, a study also prepared for the European Commission (Rodríguez-Pose and Bartalucci 2023) developed a methodological framework for measuring regional vulnerability and opportunities in the process of the green transition, combining economic, social and technological indicators. This approach leads to the conclusion that some regions have the potential to benefit from green industrial transformation, whereas others are exposed to greater structural risks.

OECD (2025) introduces the concept of regional resilience in the green transition, emphasising the capacity of regions to adapt to shocks and make use of new development opportunities. According to this approach, the key factors of resilience are economic diversification, the quality of human capital and functional institutions. Regions that lack some of these key elements generally face increased vulnerability.

A particularly important place in the literature is occupied by the analysis of differences between urban and rural areas. József Benedek, Tihamér-Tibor Sebestyén and Blanka Bartók (2018) indicate that rural regions, especially peripheral ones, have potential for the development of renewable energy sources and sustainable forms of production, but that their institutional and financial capacities are generally limited. At the same time, the European Parliament report on lagging regions highlights the most important structural weaknesses that may limit their ability to make use of the advantages offered by the green economy (European Parliament, 2020, 46). The first of these is an increasingly pronounced decline in industrial production, which leads to mass emigration, including brain drain. There are also various challenges related to accepting structural changes, especially in the most represented sectors, resulting in low productivity (e.g. agriculture and tourism). Less developed regions do not have appropriate conditions and prerequisites for business innovation and necessary investment, primarily because of the lack of the infrastructure required to support larger-scale production. Finally, less developed and lagging regions face a deficit of managerial capacities and quality, which significantly limits their ability to improve their research and innovation systems.

Analysing the development of green industries in different types of regions, Markus Grillitsch and Teis Hansen (2019) show that metropolitan areas and industrially diversified regions have more favourable conditions for attracting investment and developing innovation in the field of green technologies. By contrast, peripheral and rural regions often remain dependent on primary activities, which may deepen regional differences under the conditions of the green transition. Less developed regions do not possess adequate capacities to absorb and integrate green technologies, which constrains their efforts to adapt their economic or industrial structure to new requirements.

The importance of a place-based approach in the implementation of green policies is emphasised by Andrea Testi et al. (2023), who develop a participatory and territorially sensitive analytical framework for applying the European Green Deal at the local level. Their approach starts from the assumption that uniform policies cannot produce equal results in different spatial contexts. Similar views are advanced by the European Commission (McCann and Soete 2020) in the document "Place-based innovation for sustainability", which argues that sustainable innovations must be aligned with local resources and specificities.

The strategic document "Blueprint for the development of transition pathway" (European Commission 2022) points to the need to coordinate industrial policy and regional development in order to ensure a just transition. This approach implies synergy between sectoral policies and cohesion instruments in order to avoid the concentration of benefits in already developed centres.

Year 2026, Issue 32: 11-21
DOI: 10.7251/ZREFIS2632011S

Summarising these contributions, it may be concluded that the literature identifies three key aspects of the green transition: (1) its strong spatial dimension and uneven effects across regions (Rodríguez-Pose and Bartalucci 2024; Rodríguez-Pose and Bartalucci 2023), (2) the risk of deepening regional inequalities, particularly in less developed and rural areas (European Parliament 2020; OECD 2025), and (3) the need for a territorially sensitive, place-based approach to public policy design (Testi et al. 2023; European Commission 2022). The green transition is more than a technological or energy-related process. It is a complex territorial transformation that requires the mobilisation of local resources, respect for existing economic, demographic and social characteristics, as well as tailored policies and innovation strategies for different types of regions.

Although the cited studies are mostly focused on European Union countries, their findings have broader implications and point to the need for an empirical analysis of regional vulnerability in national contexts marked by pronounced spatial disparities. It is precisely within this framework that the analysis of regional inequalities in Serbia is positioned, with the aim of applying theoretical concepts and institutional frameworks to the specific territorial and economic context of the country.

2. DESCRIPTION OF VARIABLES

The objective of this research is to identify the direct and indirect impacts of the green transition in the Republic of Serbia at the NUTS 3 level, and to construct a composite Regional Green Transition Vulnerability Index. The basic research question is: What is the extent of the differences in vulnerability to the green transition between developed and underdeveloped regions, i.e. between urban and rural areas in Serbia? Based on the research results, the following hypothesis was tested: If there are significant differences in vulnerability to the green transition between urban and rural areas in Serbia, then there are key preconditions for designing green-transition measures in a way that corresponds to the identified regional specificities.

The Regional Green Transition Vulnerability Index is a summary indicator that reflects the multidimensionality of the green transition by encompassing its direct and indirect impacts. The green transition will have a significant effect on sectors that contribute the most to greenhouse gas emissions, namely energy, the agri-food sector, manufacturing industry, housing and transport (European Commission 2018). Following studies that have analysed vulnerability to the green transition in EU countries, the composite index was constructed on the basis of variables that quantify regional specificities and can be grouped into six pillars (Rodríguez-Pose and Bartalucci 2024): dependence on fossil fuels, industry, agriculture and land use, tourism, energy and transport.

Variables associated with the first two pillars quantify direct impacts, whereas variables covered by the remaining pillars quantify the indirect impacts of the green transition. Regions characterised by high emissions of harmful gases, the presence of heavy industry (such as mining) or significant dependence on agriculture are the most vulnerable to the green transition because of the need to ensure a gradual shift from fossil fuels to renewable energy sources and introduce a carbon dioxide (CO2) emissions tax and an emissions trading system. The need for sustainable land use, as well as the use of land for renewable energy production, may have a negative impact on the tourism sector. The construction of renewable energy infrastructure may significantly reduce the tourism attractiveness of rural areas with exceptional natural and overall environmental amenities.

Data were collected for 25 areas in Serbia, with 2023 selected as the year of observation. The statistical data used were available in the database and publications

Year 2026, Issue 32: 11-21
DOI: 10.7251/ZREFIS2632011S

("Municipalities and Regions in the Republic of Serbia" and "Regional Gross Domestic Product, Regions and Areas of the Republic of Serbia") of the Statistical Office of the Republic of Serbia (SORS), as well as in the Meteorological Yearbook - Climatological Data of the Republic Hydrometeorological Service of Serbia (RHMS).

Table 1. Descriptive statistics of the initial variables for assessing vulnerability to the green transition for 25 areas in Serbia at the NUTS 3 level, 2023

Variable	Mean	Min.	Max.	Std. dev.
CO2 emissions (agriculture, energy, transport) per capita, kt (Gg)	0.0044	0.0020	0.0131	0.0025
CO2 emissions (agriculture, energy, transport) per km2, kt (Gg)	0.3966	0.1099	3.3978	0.6398
Change in CO2 emissions (agriculture, energy, transport) per capita, 2012-2023, kt (Gg)	-0.0002	-0.0146	0.0016	0.0031
Change in CO2 emissions (agriculture, energy, transport) per km2, 2012-2023, kt (Gg)	-0.0180	-0.7629	0.4180	0.1833
Total annual gross wages in the mining sector as a share of the area's GVA	1.0393	0.0032	6.4981	1.4973
Agricultural sector GVA in relation to total area GVA	8.2788	0.6216	17.1331	4.1128
Share of employees in agriculture, forestry and fishing in total employment, %	1.6275	0.3075	4.7510	1.0850
Number of cattle per km2	9.7475	2.4468	20.2541	4.8843
Tourist arrivals/area GVA	0.7615	0.1412	3.4240	0.8129
Annual cooling degree days (CDD)	220.64	138	307	41.7412
Total registered motor vehicles and trailers	82206.88	20882	558063	103932.8

Source: Authors' research

Overall, the descriptive statistics confirm that the selected indicators capture different channels of territorial exposure to the green transition, including emission intensity, sectoral dependence, agricultural structure, tourism activity, transport pressure and climate-related demand for cooling. The observed dispersion across minimum and maximum values points to pronounced regional differences, which justifies the use of these variables in the subsequent assessment of vulnerability at the NUTS 3 level.

3. METHODOLOGY AND RESULTS

In order to test the initial hypothesis, following studies that analyse vulnerability to the green transition at the regional level, a composite index was constructed using Principal Component Analysis (PCA). As a special case of factor analysis, PCA consists of constructing new variables, expressed as linear combinations of the original independent variables, which are mutually orthogonal (Jovičić and Dragutinović Mitrović 2011, 87).

Since the selected variables are expressed in different units of measurement, all variables were standardised before applying PCA using z-scores. Two initial models were estimated, each comprising the nine variables shown in Table 1. The difference between the two models lies in the different way of measuring CO2 emissions. In the first model, two variables were used as measures of CO2 emissions: CO2 emissions (agriculture, energy, transport) per capita and change in CO2 emissions (agriculture, energy, transport) per capita. In the second model, these two variables were replaced by CO2 emissions (agriculture, energy, transport) per km2 and change in CO2 emissions (agriculture, energy, transport) per km2. A preliminary analysis of the correlation matrix for both models found that two variables - the number of cattle per km2 and tourist arrivals in relation to the area's GVA -

were not statistically significantly correlated with any of the other observed variables. Therefore, they were excluded from further PCA-based analysis. This is additionally justified by the fact that tourism in Serbia is not a primary target of decarbonisation, unlike energy, mining and livestock farming.

In order to select the better model for applying PCA - Model 1, in which emissions and changes in CO2 emissions are observed per capita, or Model 2, in which these variables are expressed per km2 - the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were applied, with the results presented in Table 2.

Table 2. Tests of sampling adequacy and sphericity

Test	Model 1 Value	Model 2 Value
Kaiser-Meyer-Olkin (KMO)	0.4172	0.6045
Bartlett: Chi-square (Pearson's $\chi 2$)	90.15	122.70
Bartlett: Degrees of freedom (df)	21	21
Bartlett: Probability (p-value)	0.0000	0.0000

Source: Authors' presentation

Based on the results presented in Table 2, it can be concluded that both models satisfy Bartlett's test of sphericity (the p-value is below 0.05), while the KMO test results indicate that Model 2 should be selected (the calculated value is above the threshold value of 0.5). The advantage of Model 2 over Model 1 also stems from the fact that, for analysis at the regional level, it is more appropriate to observe the level of activity per unit of area rather than per capita. In this way, the influence of population size on the results is eliminated (for example, the Belgrade Area has the highest CO2 emissions when observed per unit of area, whereas this is not the case when emissions are observed per capita, due to its high population density).

Table 3. Factor loadings of variables used to form the Regional Green Transition Vulnerability Index in Serbia at the NUTS 3 level

Variable	Weight/Factor loadings
CO2 emissions (agriculture, energy, transport) per km2, kt (Gg)	0.5043
Change in CO2 emissions (agriculture, energy, transport) per km2, kt (Gg)	0.3143
Total annual gross wages in the mining sector as a share of the area's GVA	-0.01804
Share of agricultural sector GVA in total area GVA	-0.4243
Share of employees in agriculture, forestry and fishing in total employment	-0.3281
CDD	0.3362
Total registered motor vehicles and trailers	0.4959

Source: Authors' research

The composite Regional Green Transition Vulnerability Index was formed using the standardised values of the seven variables of Model 2 and weights based on the first principal component, which explains the largest share of the total variance of the observed independent variables (45.85%). In this way, a summary (synthetic) indicator was formed on the basis of which the observed urban and rural areas can be ranked in terms of their vulnerability to the green transition. The PCA results indicate that two factors have a strong impact on the vulnerability of areas to the green transition: CO2 emissions per km2 and total registered motor vehicles and trailers. The factor loadings for these two variables are 0.5043 and 0.4959,

respectively (Table 3). Mining, observed through wages, has a weight close to 0 (-0.018, which implies that it has no effect, i.e. that it is statistically irrelevant for the first component), but remains included through its direct effect in terms of its contribution to total CO2 emissions. Mining is associated with two specific areas, Bor and Kolubara, which are vulnerable due to their economic dependence on mining. Regions dependent on specific sectors of the economy proved to be more vulnerable to the green transition than areas with a higher degree of economic diversification (Rodríguez-Pose and Bartalucci, 2024).

High positive weights for CO2 emissions per km2, registered motor vehicles and trailers, and CDD indicate the vulnerability of urban areas, while negative weights related to agriculture (sectoral GVA and employment share) indicate the vulnerability of rural areas. Variables related to agriculture (GVA and employment) and total gross wages in mining pull the index downwards and form the other extreme.

The first principal component is defined as a linear combination of standardised variables. The composite Regional Green Transition Vulnerability Index in Serbia for 25 areas may be written in the following form:

$$PCi = w_1x_{i1} + w_2x_{i2} + w_3x_{i3} + w_4x_{i4} + w_5x_{i5} + w_6x_{i6} + w_7x_{i7}, \textit{ i.e.} \qquad (1)$$

$$PCi = w_1x_{i1} + w_2x_{i2} + \ldots + w_4x_{i4} + w_5x_{i5} + w_6x_{i6} + w_kx_{ik} \qquad (2)$$

where:

PCi – Regional Green Transition Vulnerability Index (the value of the first principal component) for the i-th area, i = 1, 2, …, 25 (25 areas);
w_1, w_2, ..., w_k – weights calculated using PCA, identical for all units of observation (areas);
x_{i1}, x_{i2}, ..., x_{ik} – value of the variables for the i-th area (a total of k variables, k = 7);
x_{i1} – CO2 emissions (agriculture, energy, transport) per km2 for the i-th area;
x_{i2} – change in CO2 emissions (agriculture, energy, transport) per km2 for the i-th area;
x_{i3} – total annual gross wages in the mining sector in relation to the area's GVA for the i-th area;
x_{i4} – share of agricultural sector GVA in the total GVA of the area for the i-th area;
x_{i5} – share of employees in agriculture, forestry and fishing in total employment for the i-th area;
x_{i6} – annual cooling degree days for the i-th area;
x_{i7} – total registered motor vehicles and trailers for the i-th area.

Or, in abbreviated form:

$$PC_i = \sum_{j=1}^{k} w_j x_{ij} \qquad (3)$$

where:

PC_i – Regional Green Transition Vulnerability Index for the i-th area, i = 1, 2, …, 25 (25 areas);
w_j – weight of the j-th variable;
x_{ij} – standardised value of the j-th variable for the i-th area;
k – total number of variables.

Table 4 presents, for each of the 25 observed areas in Serbia, the calculated value of the composite Regional Green Transition Vulnerability Index, as well as the rank assigned to each area on the basis of the index value.

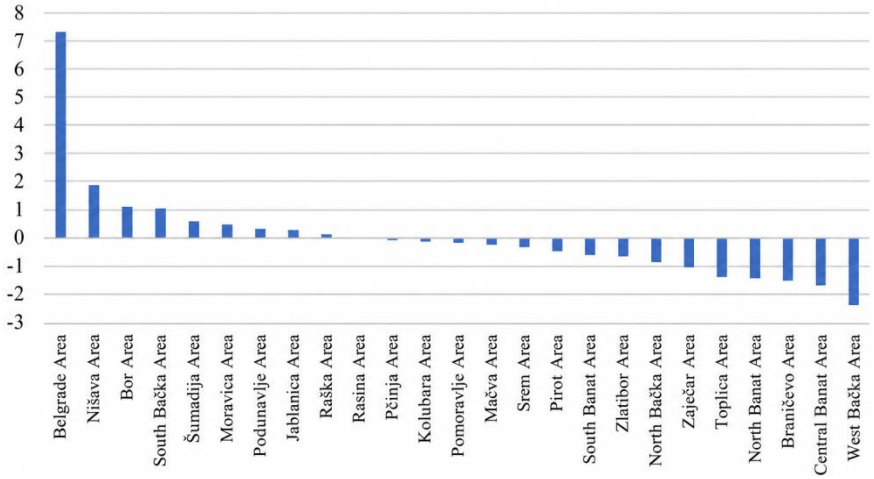
Table 4. Regional Green Transition Vulnerability Index in the Republic of Serbia at the NUTS 3 level, 2023

Area	Index	Index on a 0-1 scale	Rank
Belgrade Area	7.272456	1	1
Nišava Area	1.846271	0.4364811	2
Bor Area	1.076805	0.3565708	3
South Bačka Area	1.048227	0.3536029	4
Šumadija Area	0.589429	0.3059559	5
Moravica Area	0.4700401	0.2935572	6
Podunavlje Area	0.3207836	0.2780566	7
Jablanica Area	0.271982	0.2729885	8
Raška Area	0.0831896	0.2533821	9
Rasina Area	-0.0196919	0.2426976	10
Pčinja Area	-0.0755845	0.2368931	11
Kolubara Area	-0.132066	0.2310274	12
Pomoravlje Area	-0.1745722	0.226613	13
Mačva Area	-0.2573198	0.2180196	14
Srem Area	-0.3358077	0.2098684	15
Pirot Area	-0.5285755	0.1898492	16
South Banat Area	-0.5905026	0.1834179	17
Zlatibor Area	-0.6216182	0.1801865	18
North Bačka Area	-0.8468361	0.1567973	19
Zaječar Area	-1.038039	0.1369405	20
Toplica Area	-1.356691	0.1038479	21
North Banat Area	-1.435979	0.0956137	22
Braničevo Area	-1.509657	0.0879622	23
Central Banat Area	-1.699589	0.0682374	24
West Bačka Area	-2.356654	0	25

Source: Authors' research

The results of mapping regional vulnerability to the green transition in Serbia at the NUTS 3 level confirm the initial hypothesis, namely that there are significant differences in vulnerability to the green transition between developed and underdeveloped regions, i.e. between urban and rural areas in Serbia. Two groups of areas stand out: the first with index values above 1, and the second with index values below -1 (Figure 1). The Belgrade Area is an outlier in the statistical sense, i.e. an area whose index value is significantly higher than that of the other observed areas (7.27). Its index is considerably higher than the others due to the high concentration of vehicles and CO2 emissions. Areas with large cities are the most vulnerable.

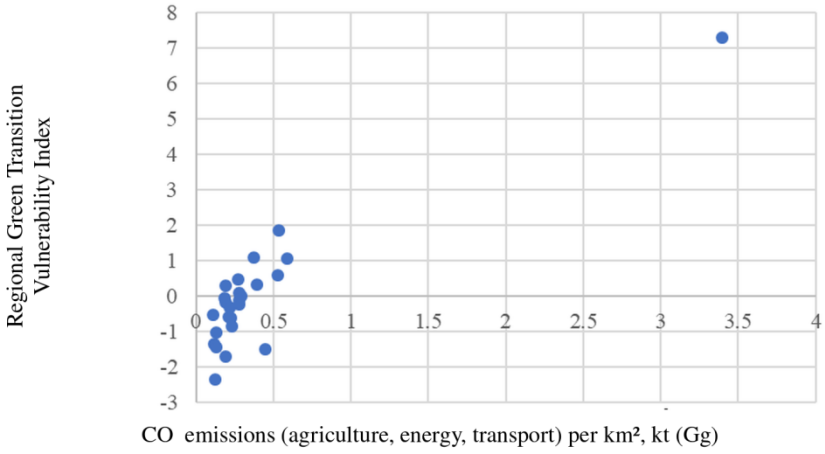
Figure 1. Regional Green Transition Vulnerability Index in the Republic of Serbia at the NUTS 3 level, 2023



Source: Authors' presentation

Given that the weights for mining and agriculture are negative, it can be concluded that there are two types of vulnerability. The green transition affects different areas differently, as confirmed by the positive weights (emissions and changes in CO2 emissions per km2, CDD and registered motor vehicles and trailers) and negative weights (wages in the mining sector and GVA and employment in the agricultural sector) of the first PCA component. The highest-ranked areas have the highest pollution and energy-intensive industry, while the lowest-ranked areas are most dependent on the primary sector (insufficient economic diversification) and have lower CO2 emissions per km2 and fewer registered vehicles.

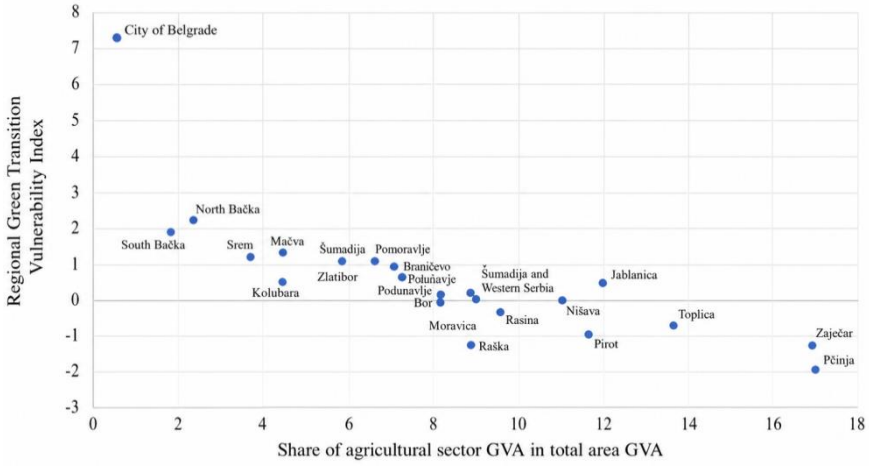
Figure 2. CO2 emissions (agriculture, energy, transport) per km2 and the Regional Green Transition Vulnerability Index, 25 areas in Serbia, 2023



Source: Authors' presentation

Two groups of areas with different types of vulnerability can be identified. The first group consists of four areas with index values greater than 1: the Belgrade, Nišava, Bor and South Bačka areas, which are characterised by urban-carbon vulnerability (the highest CO2 emissions) (Figure 2). Although decarbonisation affects urban areas most strongly, their advantage is reflected in the fact that they possess the preconditions for more efficient "greening" of economic activity, including developed infrastructure, significant human capital and solid economic diversification (Jakobsen et al. 2022; Rodríguez-Pose and Bartalucc, 2024).

Figure 3. Share of agricultural sector GVA in total area GVA and the Regional Green Transition Vulnerability Index, 25 areas in Serbia, 2023



Source: Authors' presentation

The second group consists of five areas with index values below -1: Toplica, North Banat, Braničevo, Central Banat and West Bačka, which are characterised by agrarian-structural vulnerability (high dependence on agriculture, observed through the share of agricultural GVA in total area GVA) (Figure 3). Weaker economic diversification and unfavourable demographic characteristics make these rural areas vulnerable to the changes brought by the green transition.

CONCLUSION

The green transition, that is, the shift towards a cleaner economy and new behavioural models, entails numerous economic and social effects. A particularly important place in the literature is occupied by the analysis of differences in vulnerability to the green transition between developed and underdeveloped regions, i.e. between urban and rural areas. Therefore, analyses often examine how sectoral factors such as energy, mining, agriculture, transport and tourism affect regional vulnerability. The results of recent studies, mostly focused on European Union countries, indicate the existence of significant differences in the "vulnerability" of different types of areas. Unlike urban and industrially diversified regions, which have favourable conditions for attracting investment and developing innovations in green technologies, rural regions, especially peripheral ones, often cannot make use of the advantages offered by the green economy due to structural weaknesses. Unfavourable demographic characteristics, weak diversification of the economic structure, a decline in industrial production and limited innovation, institutional and financial capacities make rural regions more vulnerable to the changes brought by the green transition.

The results of the analysis of regional inequalities in the context of the green transition in the Republic of Serbia at the NUTS 3 level indicate that there are significant differences in vulnerability to the green transition between urban and rural areas. Following studies that examine vulnerability to the green transition at the regional level, a composite Regional Green Transition Vulnerability Index for Serbia was formed using PCA. Based on its values by area, as a summary (synthetic) indicator that reflects the multidimensionality of the green transition by encompassing its direct and indirect impacts in Serbia at the NUTS 3 level, the 25 observed areas were ranked. Regions characterised by high emissions of harmful gases, the presence of heavy industry (such as mining) or significant dependence on agriculture proved to be the most vulnerable to the green transition. In addition, two groups of areas with different types of vulnerability were identified. The first group consists of areas characterised by the highest pollution (emissions and changes in CO2 emissions per km2) and energy-intensive industry, while the second group consists of areas whose economic structure is weakly diversified and based predominantly on agricultural activities.

As a complex territorial transformation, the green transition requires the mobilisation of local resources, respect for existing economic, demographic and social characteristics, as well as the design of policies, measures and strategies in a way that corresponds to identified regional specificities. Sectoral factors such as production structure, applied technology, employment, resources and infrastructure determine whether a region will be a "loser" or a "winner" of the green transition, or whether it will experience mixed effects. The experience of other countries shows that, globally, the greatest beneficiaries of the green transition will be regions with a developed economic structure based on the use of high human potential and energy predominantly derived from renewable sources. On the other hand, so-called mono-sectoral, non-diversified regions, dependent on concentrated activities with high GHG emissions and faced with limited innovation capacity, appear to be in a serious economic problem when it comes to designing a successful exit strategy.

Year 2026, Issue 32: 11-21
DOI: 10.7251/ZREFIS2632011S

REFERENCES

Benedek, József, Tihamér-Tibor Sebestyén, and Blanka Bartók. 2018. "Evaluation of Renewable Energy Sources in Peripheral Areas and Renewable Energy-Based Rural Development." *Renewable and Sustainable Energy Reviews* 90: 516–535. https://doi.org/10.1016/j.rser.2018.03.020.

Coenen, Lars, Paul Benneworth, and Bernhard Truffer. 2012. "Toward a Spatial Perspective on Sustainability Transitions." *Research Policy* 41 (6): 968–979. https://doi.org/10.1016/j.respol.2012.02.014.

European Commission. 2018. *A Clean Planet for All: A European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy*. COM(2018) 773 final. Brussels: European Commission. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773.

European Commission. 2019. *The European Green Deal*. COM(2019) 640 final. Brussels: European Commission. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640.

European Commission. 2021. *European Green Deal: Delivering on Our Targets*. Brussels: European Commission. https://doi.org/10.2775/595210.

European Commission. 2022. *Blueprint for the Development of Transition Pathways for Industrial Ecosystems*. Brussels: European Commission. https://ec.europa.eu/docsroom/documents/49407.

European Parliament. 2020. *EU Lagging Regions: State of Play and Future Challenges*. Brussels: European Parliament.

Grillitsch, Markus, and Teis Hansen. 2019. "Green Industry Development in Different Types of Regions." *European Planning Studies* 27 (11): 2163–2183. https://doi.org/10.1080/09654313.2019.1648385.

Jakobsen, Stig-Erik, Elvira Uyarra, Rune Njøs, and Arnt Fløysand. 2022. "Policy Action for Green Restructuring in Specialized Industrial Regions." *European Urban and Regional Studies* 29 (3): 312–331. https://doi.org/10.1177/09697764211049116.

Jovičić, Milena, i Radmila Dragutinović Mitrović. 2011. *Ekonometrijski metodi i modeli*. Beograd: CID, Ekonomski fakultet, Univerzitet u Beogradu.

McCann, Philip, and Luc Soete. 2020. *Place-Based Innovation for Sustainability*. Luxembourg: Publications Office of the European Union. https://doi.org/10.2760/250023.

OECD. 2025. *Strengthening Regional Policy for Resilient Places: Key Issues and Policy Considerations*. OECD Regional Development Papers 148. Paris: OECD Publishing. https://doi.org/10.1787/ea24eab5-en.

Pilati, Marta, and Alison Hunter. 2020. *Research for REGI Committee – EU Lagging Regions: State of Play and Future Challenges*. Brussels: European Parliament, Policy Department for Structural and Cohesion Policies. https://doi.org/10.2861/12822.

Republički zavod za statistiku Srbije. 2024. *Opštine i regioni u Republici Srbiji*. Beograd: Republički zavod za statistiku Srbije.

Republički zavod za statistiku Srbije. 2025. *Regionalni bruto domaći proizvod: regioni i oblasti Republike Srbije, 2023*. Beograd: Republički zavod za statistiku Srbije.

Rodríguez-Pose, Andrés, and Federico Bartalucci. 2023. *Regional Vulnerability to the Green Transition*. Single Market Economics Papers WP2023/16. Luxembourg: Publications Office of the European Union. https://doi.org/10.2873/739058.

Rodríguez-Pose, Andrés, and Federico Bartalucci. 2024. "The Green Transition and Its Potential Territorial Discontents." *Cambridge Journal of Regions, Economy and Society* 17 (2): 339–358. https://doi.org/10.1093/cjres/rsad039.

Testi, Andrea, Iacopo Zetti, Elena Tarsi, Cassandra Fontana, Maria Rita Gisotti, and Maddalena Rossi. 2023. "Supporting Local Implementation of the European Green Deal through a Place-Based, Participatory Approach: Methodology for a Comprehensive Analytical Framework." *Sustainability* 15 (20): 15098. https://doi.org/10.3390/su152015098.

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
UDC 336.143.235:331.526(497)
DOI: https://doi.org/10.7251/ZREFIS2632023B
Original scientific paper

Year 2026, Issue 32: 23-37
Received: 28th November 2025
Revised: 6th February 2026
Accepted: 12th February 2026
Published: 23th June 2026

Amra Babajić 0000-0002-6204-416X ✉ amra.babajic@untz.ba
Faculty of Economics, University of Tuzla, Bosnia and Herzegovina

Mirnesa Baraković Nurikić 0009-0000-5519-0460 ✉ mirnesa.barakovicnurikic@untz.ba
Faculty of Economics, University of Tuzla, Bosnia and Herzegovina

PUBLIC DEBT-UNEMPLOYMENT NEXUS IN SOUTHEAST EUROPE COUNTRIES

ODNOS IZMEĐU JAVNOG DUGA I NEZAPOSLENOSTI U ZEMLJAMA JUGOISTOČNE EVROPE

Summary: *The examination of the relationship between public debt and unemployment is of crucial importance for understanding macroeconomic dynamics and for designing sustainable economic policies. In recent decades, the countries of Southeast Europe (SEE) have faced a dual challenge: persistently high unemployment rates and rising levels of public debt. This paper analyzes the causal relationship between public debt and unemployment in SEE countries over the period 2004–2023, employing correlation and panel regression analysis. The study utilizes annual data spanning 20 years and covering eight SEE countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, North Macedonia, Romania, and Serbia). Empirical findings indicate a significant positive association between the growth of public debt and unemployment, particularly in the aftermath of the global financial crisis. The results underscore the need for careful fiscal policy balancing in order to mitigate the adverse effects of high indebtedness on labor markets in developing economies.*
Keywords: *public debt; unemployment; Southeast Europe; panel analysis; fiscal policy*
JEL Classification: *O40, F34*

Rezime: *Ispitivanje odnosa između javnog duga i nezaposlenosti od ključne je važnosti za razumijevanje makroekonomske dinamike i za dizajniranje održivih ekonomskih politika. Posljednjih decenija, zemlje jugoistočne Evrope (JIE) suočile su se s dvostrukim izazovom: uporno visokim stopama nezaposlenosti i rastućim nivoima javnog duga. Ovaj rad analizira uzročno-posljedičnu vezu između javnog duga i nezaposlenosti u zemljama JIE u periodu 2004–2023, koristeći korelacijsku i panel regresijsku analizu. Studija koristi godišnje podatke koji obuhvataju 20 godina i obuhvataju osam zemalja JIE (Albaniju, Bosnu i Hercegovinu, Bugarsku, Hrvatsku, Grčku, Sjevernu Makedoniju, Rumuniju i Srbiju). Empirijski nalazi ukazuju na značajnu pozitivnu povezanost između rasta javnog duga i nezaposlenosti, posebno nakon globalne finansijske krize. Rezultati naglašavaju potrebu za pažljivim uravnoteženjem fiskalne politike kako bi se ublažili negativni efekti visoke zaduženosti na tržišta rada u zemljama u razvoju.*
Ključne riječi: *javni dug; nezaposlenost; Jugoistočna Evropa; panel analiza; fiskalna politika*
JEL kasifikacija: *O40, F34*

1. INTRODUCTION

Public debt represents the accumulation of a government's obligations to both domestic and foreign creditors, while unemployment reflects structural weaknesses in the labor market and directly affects social stability and economic growth. A high level of public debt may constrain the government's fiscal space, reduce its capacity to invest in productive sectors, and increase dependence on international financial institutions. Simultaneously, rising unemployment generates lower aggregate demand, social tensions, and long-term consequences for human capital. When these factors are analyzed jointly, a complex relationship emerges in which fiscal policy and labor market dynamics may interact in either mutually reinforcing or mutually restrictive ways.

For developing and transitional economies, such as the countries of Southeast Europe (SEE), this line of research is particularly important. A high unemployment rate combined with rising public debt can lead to the so-called "debt-unemployment spiral," in which declining tax revenues and increased social expenditures place additional strain on the budget, ultimately resulting in further borrowing. Analyzing this relationship enables a deeper understanding of the limits of fiscal sustainability and the design of policies that balance the need for economic growth, social protection, and macroeconomic stability.

Thus, the study of public debt and unemployment contributes not only to academic knowledge but also holds direct practical value: it assists policymakers in making evidence-based decisions, helps investors assess risk, and enables the general public to better understand the socio-economic challenges their countries face. The economic challenges experienced by SEE countries in recent decades have been shaped by a dual pressure: high public debt and persistently elevated unemployment rates. The post-1990 transition period was marked by structural reforms, privatization, and integration into European economic frameworks. However, the 2008 global financial crisis and the subsequent eurozone debt crisis significantly impacted the region, deepening fiscal deficits and increasing debt levels. The COVID-19 pandemic further intensified fiscal pressures, while lockdowns and reduced economic activity led to a surge in unemployment.

Public debt is often used as a fiscal instrument to stabilize the economy, but in cases of inefficient management, it can have counterproductive effects – particularly on the labor market. This study is based on the premise that public debt, although a necessary tool of economic policy, may have long-term adverse consequences for employment. The focus of the research is to quantify this relationship using panel analysis for SEE countries over the period 2004–2023. The subject of the study is the relationship between public debt and unemployment rates in SEE countries. The aim of this paper is to empirically examine whether a statistically significant relationship exists between the level of public debt and unemployment in the region. The importance of the research lies in providing empirical evidence to policymakers, offering insights into the potential negative effects of excessive borrowing on labor markets, and thereby contributing to the formulation of more sustainable fiscal policies in the region.

The central research question is: Does public debt significantly affect the unemployment rate in SEE countries? Additional research questions, which will be explored qualitatively, descriptively, and through comparative analysis (without inclusion in the regression model), include: Does the effect of debt differ between crisis and post-crisis periods? And does the institutional framework and EU membership mitigate or amplify this relationship?

The main research hypothesis is:

H1: An increase in public debt raises the unemployment rate in SEE countries.

In addition to this hypothesis, the study will attempt to validate two secondary hypotheses through descriptive, qualitative, and comparative analysis:

H2: The effect of public debt on unemployment is stronger during crisis periods.

H3: EU member states are more effective in mitigating the negative effects of public debt.

The significance of this research lies in its contribution of empirical evidence to both policymakers and the academic community, offering region-specific findings that may support the development of more sustainable fiscal policy frameworks.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

2. THEORETICAL FRAMEWORK

The relationship between public debt and unemployment has been the subject of longstanding theoretical debate, with various schools of economic thought offering divergent explanations. According to Keynesian theory (Keynes 1936), an increase in public debt during periods of recession may have a short-term positive effect on employment. Specifically, additional government spending financed through borrowing stimulates aggregate demand and output, leading to higher employment and reduced unemployment. This mechanism is grounded in the concept of the fiscal multiplier, which posits that each additional unit of public expenditure generates a proportionally greater increase in GDP, provided that economic resources are not fully utilized. However, these effects are typically limited to the short run, while in the long term, rising debt levels may produce adverse consequences (Jahan, Mahmud, and Papageorgiou 2014, 53).

In contrast, neoclassical theory emphasizes the negative implications of public debt through the so-called crowding-out effect (Dombi and Dedák 2019). An increase in government borrowing in financial markets reduces the availability of funds for the private sector, which in turn raises interest rates and diminishes the volume of private investment. While such borrowing may initially stimulate demand, the long-term outcome is reduced economic efficiency and rising unemployment. This effect is particularly pronounced in countries with underdeveloped financial markets and limited domestic savings capacity, whereas in economies with well-developed capital markets, its impact may be less significant.

Furthermore, the theory of fiscal sustainability highlights the importance of market stability and investor confidence (Salmon 2025). When public debt exceeds a certain threshold, investors may begin to question the government's ability to service its obligations in a timely manner. This skepticism can lead to an increase in risk premiums and interest rates, thereby placing additional strain on public finances and potentially triggering fiscal and macroeconomic crises. Such circumstances not only constrain the scope for effective economic policymaking but also exert a negative impact on economic activity and labor market performance. Accordingly, this theory emphasizes that debt sustainability depends on maintaining a balance between GDP growth, fiscal discipline, and the structure of public borrowing.

On the other hand, endogenous growth models offer a more nuanced perspective on the relationship between public debt and employment. These models posit that the impact of public debt depends primarily on its intended use. If borrowed funds are allocated to productive investments – such as education, research and development, or infrastructure – debt can stimulate productivity growth, enhance competitiveness, and generate new employment opportunities. However, if resources are directed toward non-productive purposes or solely toward current consumption, debt may merely increase fiscal risks without yielding long-term benefits. In other words, public debt is neither inherently positive nor negative; its effects depend on the quality of fiscal management and the broader institutional framework.

These theoretical perspectives demonstrate that the relationship between public debt and unemployment is not unambiguous, but rather depends on the time horizon, structural characteristics of the country, and the orientation of fiscal policy. While Keynesian theory emphasizes the short-term benefits of borrowing, neoclassical and fiscal sustainability approaches highlight the long-term risks. Endogenous growth models further underscore the importance of public debt management quality, suggesting that the purpose and efficiency of resource allocation ultimately determine its actual economic and social impact. In the context of Southeast European countries, elevated public debt levels may exacerbate unemployment – an effect that is empirically examined in this study.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

3. PREVIOUS RESEARCH

The impact of public debt on economic growth and labor market performance has been the subject of extensive empirical research worldwide. A review of prior studies facilitates a deeper understanding of the mechanisms through which debt influences employment and overall economic performance, as well as the identification of factors that amplify or mitigate these effects. In this section, we highlight several recent studies that examine the relationship between public debt and unemployment.

Checherita-Westphal and Rother (2010) conducted a panel analysis of 12 euro area countries over the period 1970–2009, employing a dynamic and nonlinear model. Their findings indicate that public debt exerts a negative effect on economic growth, particularly when the debt-to-GDP ratio exceeds the threshold of 90–100%. These results provide additional support for debt reduction strategies aimed at sustaining long-term growth prospects (Checherita-Westphal and Rother 2010). Similar conclusions are drawn by Reinhart and Rogoff (2010) in their global analysis of 44 countries spanning two centuries, which demonstrates that debt levels above 90% of GDP significantly reduce average growth rates and indirectly affect employment outcomes (Reinhart and Rogoff 2010, 573).

Kumar and Woo (2010), through a panel analysis of both advanced economies and emerging markets over the period 1970–2009, also emphasize the long-term negative impact of elevated public debt on economic growth, with the effect being less pronounced in developed economies. Their empirical findings suggest that, on average, a 10-percentage-point increase in the initial debt-to-GDP ratio is associated with a slowdown in annual per capita real GDP growth of approximately 0.2 percentage points (Kumar and Woo 2010, 1).

Mihaiu (2014) aimed to analyze public debt in EU member states through the lens of the "golden rule" of public borrowing. The study covers the period from 2008 to 2012 and examines the relationship between the level of public debt, public investment, unemployment, and economic growth, with the objective of identifying the patterns of debt utilization and its effects in the context of fiscal sustainability. The findings indicate an inverse relationship between public debt and public investment, suggesting that rising debt levels do not contribute to increased investment, but are instead accompanied by a decline in capital expenditures.

Mencinger, Aristovnik, and Verbic (2014) empirically investigate the transmission mechanism of the short-term impact of public debt on economic growth in European Union countries affected by the sovereign debt crisis. The analysis encompasses a sample of 25 EU member states and utilizes recent data, with particular attention given to the nonlinear and concave relationship between debt and growth. A panel growth model augmented with a debt variable is employed, accounting for issues of heterogeneity and endogeneity. The results confirm a statistically significant nonlinear effect of debt on per capita GDP growth. The threshold beyond which debt begins to exert a negative influence varies across country groups: for older member states, it ranges between 80% and 94% of GDP, while for newer member states, it is lower–approximately 53–54%. These findings suggest that the sustainable level of indebtedness is lower in newer member states, indicating their greater vulnerability to public debt pressures.

Coccia (2012) investigated the relationship between labor market dynamics and the drivers of technological innovation in European countries, incorporating public debt as a structural indicator. The findings reveal that public investment in education and the intensity of expenditure on research and development exert a positive influence on employment rates, whereas the growth of consolidated public debt negatively affects both employment and

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

indicators of technological advancement. These empirical results provide a foundation for considering key implications for economic policy formulation.

Bexheti et al. (2020) analyzed the impact of public debt on economic growth in Western Balkan countries over the period 2003–2016. Their study identified a mild negative relationship between public debt and economic growth in the region, with a debt threshold of 50.87% of GDP beyond which the adverse effects on growth become more pronounced.

Babajić and Suljić (2024) conducted a comprehensive review of the SCOPUS database to summarize scholarly publications that examined the nexus between public debt and economic growth. The observed period spanned from 1984 to 2023, during which a total of 258 publications were identified. The highest number of studies was published in 2021 and 2022. Geographically, "countries with the largest number of published papers are: Germany (23), USA (23), South Africa (20), India (15), United Kingdom (15), etc." (Babajić and Suljić 2024, 38). In addition to the bibliometric analysis, the authors investigated the impact of public debt on economic growth in Bosnia and Herzegovina during the period 2008–2020. Their findings reveal a statistically significant and negative relationship between public debt and GDP growth. Moreover, they suggest that lower levels of indebtedness are conducive to stronger economic performance.

In its 2021 working paper focused on developing countries, the IMF emphasizes that fiscal shocks associated with high public debt further exacerbate labor market conditions. Within the European Union, Turrini (2013) demonstrated that fiscal consolidation can lead to an increase in short-term unemployment, particularly through reductions in public expenditure. Similarly, Cocozza et al. (2011) highlight a significant relationship between fiscal deficits and unemployment in the newer EU member states.

Alnaa and Matey (2023) analyze the dynamic relationship between external debt and unemployment in Sub-Saharan African countries, based on a sample of 25 states. The results indicate a significant correlation between rising external debt and increasing unemployment, largely attributed to the inadequate implementation of discretionary fiscal policies and inefficient management of borrowed funds. Furthermore, the findings suggest that the relationship between debt and unemployment is not linear, but rather exhibits more complex patterns across the observed economies.

Although there is extensive literature on the relationship between public debt and unemployment, the role of institutional quality in this nexus has largely been overlooked. Tang and Issahaku (2024) examine the impact of institutional quality on the link between public debt and unemployment in Sub-Saharan Africa, using panel data from 36 countries over the period 1996–2020. The study employs the System Generalized Method of Moments (SGMM) as its methodological framework. The results indicate that borrowing has not contributed to reducing unemployment, whereas institutional quality serves as a significant moderating factor that enables debt to be directed toward job creation. The authors conclude that in the absence of strong institutions, public debt does not support employment, and they recommend strengthening institutional capacities as a prerequisite for more effective debt utilization.

Sengupta, Talukder and Atal (2025) examine the relationship between public debt and unemployment by analyzing 162 countries, grouped into four continental regions (Africa, the Americas, the Asia-Pacific region, and Europe) and three income categories (low-, middle-, and high-income countries) over the period 1996–2019. Their findings indicate that a 1% increase in central government debt corresponds to a 1.6% rise in global unemployment (Sengupta, Talukder, and Atal 2025). Among the continents, the strongest impact is observed in Europe (4.1%), followed by Africa (0.9%), while the coefficients for the Americas and the Asia-Pacific region are not statistically significant. The dynamic assessment reveals that public debt is a significant predictor of unemployment across all regions.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

Finally, the World Bank's 2023 report on the Balkan region reveals a correlation between public expenditure and labor market conditions, suggesting that fiscal policy exerts a direct influence on employment and economic performance in the region.

All of these findings point to the existence of a negative impact of high public debt on economic growth and employment, with effects being amplified in the presence of fiscal shocks, weak institutional frameworks, and within countries with lower economic capacity. This theoretical and empirical evidence provides a foundation for further analysis of the mechanisms through which debt influences labor market dynamics and overall economic stability.

4. DATA AND METHODOLOGY

The study utilizes panel data for 10 Southeast European (SEE) countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, North Macedonia, Montenegro, Romania, Serbia, Kosovo*[1], and Greece, covering the period from 2004 to 2023. Due to data limitations, Montenegro and Kosovo* were excluded from further analysis. The data were obtained from the International Monetary Fund (IMF) database. Table 1 presents the research variables and their respective notations used in the model.

Table 1. Research Variables

Types of variables	Name of variable	Variable Labels
Dependent variable	unemployment rate (% of labor force)	UNEMP
Independent variable	public debt (% GDP)	DEBT
Control variables	GDP per capita	GDP
	inflation rate	INF

Source: Authors' creation

A fixed effects (FE) model was used due to the expected heterogeneity across countries. The model is as follows:

$$UNEMP_{it} = \beta_0 + \beta_1 DEBT_{it} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \alpha_i + \varepsilon_{it} \qquad \text{(Formula 1)}$$

Where is it:
UNEMP – unemployment rate
DEBT – public debt
GDP – gross domestic product per capita (in thousands USD)
INF – inflation rate
β – coefficients
α_i *– non-territorial fixed component*
ε_{it} *– error*
i – observed SEE country (where is i = 1–8; where is it 1=Albania, 2=BiH,...)
t – time period (year) (where is t = 2004–2023)

The analysis was performed in STATA software. The following tests were applied:

- Hausman test – choosing between FE and RE models. The Hausman test rejects the null hypothesis that the random effects estimator is consistent ($p < 0.05$), indicating that the fixed effects model is the appropriate specification.
- Skewness/Kurtosis tests for Normality – for testing the normality of the distribution

[1] This designation is without prejudice to status and is in line with United Nations Security Council Resolution 1244 and the official position of Bosnia and Herzegovina.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

- Variance inflation factor – autocorrelation testing
- Breusch-Pagan / Cook-Weisberg test – heteroskedasticity check
- Levin-Lin-Chu test – stationarity check.

In this research, the first hypothesis (H1) is formally tested, which refers to the connection between public debt and the unemployment rate in the countries of Southeast Europe. The fixed effects regression model was applied to panel data for the period 2004–2023. Basic model assumptions, including multicollinearity, normality, and heteroskedasticity, were tested prior to estimation, and no serious problems were identified.

Additional research questions, addressing the intensity of effects during crisis and post-crisis periods (H2), as well as the role of institutional frameworks and European Union membership (H3), were examined qualitatively through descriptive and comparative analysis of available data. This approach ensures methodological consistency – the formal model is focused on the core relationship between public debt and unemployment, while the broader institutional and crisis-related context is explored descriptively and comparatively.

5. ANALYSIS RESULTS

Table 2 presents the basic results of descriptive statistics for the variables used in the analysis of Southeast European (SEE) countries. The table reveals a general heterogeneity among SEE countries, while a more detailed breakdown by country and year sheds light on specific trends. The average level of public debt during the observed period was 58.8% of GDP. However, the range is quite wide – from as low as 12.49% to as high as 226.65%, with a standard deviation of 45.3 –indicating substantial differences in indebtedness across countries. Some countries maintain relatively stable fiscal positions, while others are characterized by pronounced over-indebtedness.

In terms of country-specific debt levels, Greece represents the most extreme case. Its public debt ranged from 104.3% of GDP in 2004 to a record 226.6% in 2020, reflecting the financial and sovereign debt crisis that peaked between 2009 and 2015. On the other hand, the lowest debt level was recorded in Romania in 2008 (12.49% of GDP), during a period of strong economic growth prior to the global financial crisis. Bosnia and Herzegovina maintained moderate debt levels (around 25–35%) for an extended period, but experienced an upward trend after 2009, reaching a peak of 47.23% in 2014. A similar pattern is observed in Serbia, where debt exceeding 60% of GDP in 2004 declined by 2008, only to rise again and reach 70% in 2015. Albania also entered a zone of high indebtedness, with a steady increase from around 55% in the mid-2000s to over 74% in 2020–2021.

The average unemployment rate stands at 15.8%, which is significantly above the European Union average (5.6% in 2024) and the broader European average (3.6% in 2024), indicating a chronic labor market issue in the observed region. The minimum recorded value is 4.2%, while the maximum reaches 37.3%, with a standard deviation of 8.1 – highlighting deep structural disparities among Southeast European (SEE) countries. Some economies are closer to full employment, while others experience exceptionally high unemployment rates.

North Macedonia recorded the highest unemployment rates, exceeding 36% between 2004 and 2006, although the situation improved considerably by 2023 (13.1%). A similar pattern is observed in Bosnia and Herzegovina, where unemployment stood at 31.1% from 2004 to 2006 and gradually declined to 13.2% in 2023. Greece experienced a dramatic surge in unemployment following 2010 – from 9.6% in 2009 to a peak of 27.5% in 2013 – clearly reflecting the consequences of the economic crisis and austerity measures. In contrast, Bulgaria, Romania, and Croatia have shown a downward trend in unemployment over the

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

past decade. Bulgaria reduced its rate from 12.2% in 2004 to 4.4% in 2023, while Romania fell below 5% as early as 2019.

GDP per capita averages USD 9.7 thousand, which is significantly below the average of developed European economies (USD 62.32 thousand in the EU in 2024). The lowest recorded value is USD 2.4 thousand, while the highest reaches USD 31.74 thousand, with a standard deviation of USD 6.3 thousand. These figures confirm the existence of a substantial gap in the level of economic development within the region itself. The highest value was recorded in Greece in 2008 (USD 31.7 thousand), while Albania had the lowest in 2004 (USD 2.4 thousand). However, Albania has made notable progress over the past 20 years, reaching USD 8.5 thousand in 2023. Croatia also experienced stable growth, increasing from USD 9.7 thousand in 2004 to USD 21.9 thousand in 2023, while Romania rose from USD 3.5 thousand in 2004 to USD 18.4 thousand in 2023. These trends clearly indicate a convergence of certain Southeast European countries toward the EU average.

Inflation averaged 3.55%, which falls within the range of moderate inflation, but was marked by considerable volatility. The minimum recorded value was -1.6% (deflation), while the maximum reached 16.3%, with a standard deviation of 3.8. These figures suggest that Southeast European (SEE) countries experienced episodes of macroeconomic instability during the observed period. The most volatile inflation rates were recorded in Serbia and Romania. In Serbia, inflation peaked at 16.3% in 2005, while Romania registered 11.9% in 2004. Both countries later experienced periods of deflation – Romania at -1.6% in 2016, Bulgaria at -1.6% in 2014, and Croatia at -0.6% in 2016.

In contrast, the entire region faced a strong inflationary shock in 2022, driven by global energy and food crises: Albania (6.7%), Bosnia and Herzegovina (14.0%), North Macedonia (14.2%), Romania (13.8%), Serbia (12.0%), Bulgaria (13.0%), Croatia (10.7%), and Greece (9.3%). This surge clearly demonstrates the vulnerability of SEE countries to global price disruptions and their dependence on energy imports.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
debt	160	58.828	45.295	12.49	226.65
unemployment	160	15.789	8.109	4.2	37.3
gdp pc	160	9.705	6.295	2.4	31.74
inflation	160	3.554	3.802	-1.6	16.3

Source: Authors' creation

Overall, the presented statistics confirm the heterogeneity of Southeast European (SEE) countries. While some economies exhibit more stable macroeconomic performance, others face high public debt, structural unemployment issues, and inflation volatility – further underscoring the need for a comparative approach in economic analysis and policy design. In this context, the data reveal several key patterns:

1. Greece stands out due to its extremely high public debt and dramatic fluctuations in unemployment.
2. Bosnia and Herzegovina and North Macedonia have long struggled with chronically high unemployment, although recent trends indicate improvement.
3. Albania and Romania have achieved significant growth in GDP per capita, while Croatia and Bulgaria demonstrate a more stable convergence toward the EU average.
4. Inflation has fluctuated throughout the observed period, but the global crisis of 2022 exposed a shared vulnerability among all SEE countries.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

This heterogeneity clearly indicates that, although Southeast European (SEE) countries share certain similarities, their developmental trajectories and macroeconomic challenges remain distinct. This implies the need for tailored policy approaches rather than uniform regional solutions.

Following the descriptive statistics and the explanation of variable trends across countries and over time, a further data analysis was conducted to determine the intercorrelation among the observed variables. In this context, it was first necessary to assess whether the variables were stationary during the observed period. The Levin-Lin-Chu panel unit root test indicated that all variables were non-stationary, as the p-values were greater than or equal to 0.05, meaning the null hypothesis of non-stationarity could not be rejected. First differences were applied, and upon retesting, the variables were found to be stationary. The Levin–Lin–Chu test indicated that all observed variables are non-stationary in level, but stationary in the first difference. Given that the paper did not conduct panel cointegration testing, the empirical analysis based on the fixed-effects model in the first differences is interpreted exclusively as an analysis of the short-term dynamics between changes in public debt and unemployment. Accordingly, the results do not allow for conclusions to be drawn about the long-term relationships between the variables.

Table 3. Pairwise correlations

Variables	**(1)**	**(2)**	**(3)**	**(4)**
(1) d_debt	1.000			
(2) d_unemployment	0.308*	1.000		
(3) d_gdp_pc	-0.340*	-0.341*	1.000	
(4) d_inflation	-0.226*	-0.146	0.151	1.000

**** p<0.01, ** p<0.05, * p<0.1*

Source: Authors' creation

Table 3 presents the pairwise correlations among the observed variables: changes in public debt (d_debt), unemployment rate (d_unemployment), GDP per capita (d_gdp_pc), and inflation (d_inflation). The results indicate a positive and statistically significant relationship between changes in public debt and unemployment rate ($r = 0.308$, $p < 0.1$), suggesting that rising public debt is often accompanied by increasing unemployment. Conversely, changes in public debt show a negative and significant correlation with changes in GDP per capita ($r = -0.340$, $p < 0.1$), implying that debt accumulation may be associated with slower economic growth.

Additionally, a negative correlation is observed between changes in unemployment and GDP per capita ($r = -0.341$, $p < 0.1$), which aligns with theoretical expectations – employment growth typically coincides with increased economic output. Regarding inflation, it exhibits a negative but weaker association with changes in public debt ($r = -0.226$, $p < 0.1$), while its correlations with other variables (unemployment and GDP per capita) are low and statistically insignificant. This suggests that inflation, within the observed sample, has a limited connection to other macroeconomic indicators.

Overall, the correlation results highlight that the relationships between public debt, unemployment, and economic growth are the most pronounced and statistically significant, whereas inflation appears to be less strongly linked to the other variables.

For the purposes of this research, a panel regression framework was employed, allowing for the simultaneous observation of variability across countries and over time. Both fixed effects (FE) and random effects (RE) models were tested in the analysis. The choice between fixed effects and random effects specifications was formally assessed using the Hausman test. The results indicate a statistically significant difference between the FE and RE

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

estimators ($p = 0.038 < 0.05$), supporting the use of the fixed effects model. The Breusch–Pagan Lagrangian multiplier test was applied solely to reject the pooled OLS specification in favor of a panel framework. This outcome aligns with the initial assumption, given the heterogeneity among countries.

The fixed effects approach enables control for country-specific characteristics that remain constant over time – such as geographic location, institutional legacy, and cultural attributes – which could otherwise influence the estimates. Consequently, the estimated coefficients in this model reflect the pure relationship between changes in public debt and unemployment within countries.

To ensure the validity of the model, additional diagnostic tests were conducted. First, the normality of residuals was examined using the Skewness/Kurtosis tests for Normality, confirming that the error distribution does not significantly deviate from normality, thereby enhancing the reliability of the estimates. Next, multicollinearity among explanatory variables was assessed through a correlation matrix and evaluation of the Variance Inflation Factor (VIF), with no issues detected that could compromise coefficient stability. The Breusch-Pagan test for heteroskedasticity was also performed, and the results did not indicate significant signs of heteroskedasticity.

Based on all the diagnostic tests conducted, it can be concluded that the selected fixed effects model is stable and suitable for empirical analysis of the relationship between public debt, unemployment, and additional macroeconomic variables in Southeast European countries.

Table 4. Regression results (FE model)

d_unemployment	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
d_debt	.047	.02	2.34	.050	0	.093	*
d_gdp_pc	-.429	.094	-4.57	.003	-.651	-.207	***
d_inflation	-.025	.03	-0.81	.444	-.097	.047	
Constant	-.364	.063	-5.81	.001	-.513	-.216	***

Mean dependent var	-0.515	SD dependent var	1.727
R-squared	0.171	Number of obs	152
F-test	168.783	Prob > F	0.000
Akaike crit. (AIC)	565.628	Bayesian crit. (BIC)	574.700

*** *p<.01, ** p<.05, * p<.1*

Source: Authors' creation

The results of the fixed effects panel regression are presented in Table 4. The dependent variable is the change in the unemployment rate (d_unemployment), while the explanatory variables include changes in public debt (d_debt), GDP per capita (d_gdp_pc), and inflation (d_inflation).

The coefficient for public debt (d_debt) is positive (0.047) and statistically significant at the 10% level ($p = 0.050$)., indicating that, in the short run, increases in public debt are associated with rising unemployment rates. This result reflects short-term fiscal and macroeconomic adjustments within countries rather than long-term structural effects.

The coefficient for GDP per capita is −0.429 and is statistically significant at the 1% level ($p = 0.003$). The negative sign indicates that an increase in economic output per capita reduces the unemployment rate, which is consistent with economic theory and empirical expectations. In other words, economic growth contributes to improved labor market conditions.

The coefficient for inflation is −0.025, but it is not statistically significant ($p = 0.444$). This indicates that inflation during the observed period did not exhibit a clear or stable relationship with the unemployment rate. This finding is somewhat expected, given that

inflation in the region was largely driven by external shocks (e.g., global energy prices) and did not directly reflect labor market dynamics.

The constant term is negative (−0.364) and statistically significant ($p < 0.01$), indicating that there are additional factors influencing unemployment that are not captured by the model.

The R-squared value = 0.171 indicates that the model explains about 17% of the variation in unemployment within countries over time. Although this percentage may seem modest, it is common for macroeconomic panel studies where complex relationships between fundamental economic variables are analyzed.

The F test is 168.783, $p = 0.000 < 0.01$, confirming that the model as a whole is statistically significant, that is, that it explains the variation of the dependent variable better than the model without predictors.

The results of the FE model confirm that public debt has a statistically significant and positive impact on the unemployment rate, while GDP per capita growth significantly reduces unemployment. Inflation, on the other hand, does not show a stable relationship with the labor market. These findings highlight the need for careful management of fiscal policy in SEE countries: although public debt is often used to mitigate crises, its excessive increase can further strain the labor market.

6. DISCUSSION OF EMPIRICAL RESEARCH RESULTS

It is important to emphasize that the interpretation of the empirical results refers to the short-term relationships between changes in public debt and unemployment, given that the analysis was conducted in first differences without testing long-term cointegration. The results confirm that public debt has a significant and positive impact on unemployment in the region. This relationship is particularly pronounced during crisis years (2008–2012 and 2020), when countries adopted expansionary fiscal policies without achieving effective labor market outcomes – increasing public spending without a proportional reduction in unemployment. These findings are consistent with the results of Sengupta, Talukder and Atal (2025), but diverge from the Keynesian perspective, which would anticipate the opposite effect.

The correlation results provide valuable insight into the interrelationships among the key observed macroeconomic variables during the analyzed period. Particularly noteworthy is the positive and statistically significant association between changes in public debt and changes in unemployment ($r = 0.308$). This finding suggests that, in many cases, increases in public debt occur alongside rising unemployment rates. Although correlation analysis does not permit conclusions about causality, the result clearly indicates that fiscal pressures and labor market dynamics are closely linked and should be considered jointly in economic analysis and policy design.

Another important finding is the negative correlation between public debt and GDP per capita ($r = −0.340$). This result suggests that rising debt levels often coincide with declining economic growth. In other words, higher borrowing tends to occur during periods of economic weakness, further underscoring the vulnerability of countries with elevated levels of public debt.

The negative correlation between unemployment and GDP per capita ($r = −0.341$) confirms one of the fundamental macroeconomic principles: economic growth tends to reduce unemployment, whereas stagnation or recession leads to deteriorating labor market conditions. This result aligns with theoretical expectations and provides additional confirmation of the validity of the data and methods used.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

With regard to inflation, its correlations with other variables are weak and statistically insignificant. This indicates that, within the observed sample, inflation does not exhibit a clear or stable relationship with public debt, unemployment, or GDP per capita. Such a finding may reflect the specific characteristics of the analyzed period, marked by various crisis episodes, during which inflation did not consistently follow the typical patterns of movement observed in other macroeconomic indicators.

In a broader sense, these findings confirm that public debt cannot be viewed in isolation. Its dynamics are inextricably linked to labor market developments and economic growth. Although debt accumulation often represents a necessary response to economic shocks, it also serves as an indicator of deteriorating macroeconomic performance. Therefore, fiscal policy focused solely on debt control should not overlook its implications for employment and citizens' living standards. The results are consistent with the findings of Alnaa and Matey (2023), while also reflecting regional specificities.

Empirical research indicates that public debt in Southeast European (SEE) countries is significantly associated with short-term increases in unemployment, with the adverse effects being particularly pronounced during crisis years. A detailed country-level analysis provides insight into the specific characteristics and mechanisms through which public debt is associated with short-term deterioration in labor market conditions:

Greece

Greece was the most severely affected by the debt crisis during the period 2010–2015. Public debt exceeded 180% of GDP, leading to a record unemployment rate of 27% in 2013. Our empirical findings strongly confirm this situation, indicating a direct correlation between high debt levels and a dramatic deterioration in labor market conditions, particularly among youth and in the construction sector. The crisis also revealed the limitations of fiscal policy under extreme debt conditions, where reductions in public spending further exacerbated unemployment.

Croatia

Following its accession to the EU in 2013, Croatia experienced a rise in public debt after 2008, accompanied by high youth unemployment. However, EU membership enabled access to structural and cohesion funds, which contributed to a reduction in unemployment and a gradual recovery of the labor market. This case highlights the importance of institutional support and international assistance in mitigating the adverse effects of public debt on employment.

Romania and Bulgaria

Both countries recorded rapid economic growth that helped reduce unemployment, although public debt increased after 2009. The impact of public debt on the labor market was weaker than in Greece or Croatia, suggesting that strong economic growth and diversification can partially offset the negative consequences of high debt levels.

Serbia and Bosnia and Herzegovina

Both countries are characterized by persistently high unemployment. Fiscal expansion and increased public spending did not lead to significant reductions in unemployment, indicating the presence of structural labor market issues, including mismatches between education systems and labor market needs, labor market rigidity, and weak institutional frameworks.

Albania and North Macedonia

Although these countries have relatively lower levels of public debt, persistently high unemployment suggests that fiscal policy alone is insufficient to address labor market

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

challenges. Structural reforms, institutional strengthening, and private sector development remain key factors for sustainable unemployment reduction.

Following the qualitative country analysis, panel models were applied to examine the relationships among the analyzed variables, with particular attention given to the choice between fixed and random effects models. The data analysis began with testing fundamental assumptions to ensure the validity of the results.

First, the normality of the data was assessed, and the distributions did not show significant deviations from normality, allowing for the continuation of regression analysis. Next, multicollinearity was examined using Variance Inflation Factor (VIF) values, with none of the included variables indicating a high degree of interdependence. Heteroskedasticity was also tested, and the results showed that residual variances remained approximately constant, with no significant deviations.

After confirming that no major issues were present regarding model assumptions, the Breusch and Pagan Lagrangian multiplier test was conducted to choose between fixed and random effects. Based on the test results, the fixed effects model was selected, as it demonstrated greater consistency and reliability compared to the random effects model. The application of the fixed effects model allowed for the elimination of unobservable characteristics that remain constant over time within the observed units, resulting in more precise estimates and more reliable interpretation of the relationships between variables.

The qualitative analysis further supports the findings of the regression model. The impact of public debt on unemployment was particularly pronounced during the global financial crisis (2008–2012) and the pandemic crisis (2020). In these periods, rising public debt was accompanied by increasing unemployment, consistent with the theory of pro-cyclical fiscal behavior during economic downturns.

Institutional frameworks and EU membership also emerge as significant factors. The cases of Croatia, Bulgaria, and Romania suggest that access to EU funds and institutional support can facilitate faster labor market recovery, while non-member countries such as Bosnia and Herzegovina, Serbia, and North Macedonia continue to experience chronically high unemployment rates. Although these effects were not formally tested in the regression model, qualitative indicators clearly suggest that institutional support mitigates the negative impact of public debt on labor market outcomes, in line with the findings of Tang and Issahaku (2024).

7. CONCLUSION AND RECOMMENDATIONS

This paper shows that there is a positive and significant relationship between public debt and unemployment in SEE. Although debt is often a necessary tool for economic stabilization, its excessive use can cause negative effects on the labor market (slow down the recovery of the labor market and increase the vulnerability of countries in periods of crisis). The results indicate the existence of a short-run positive association between changes in public debt and unemployment in Southeast European countries, while the analysis of long-run relationships remains beyond the scope of this study. Recommendations for the policies of developing countries, with special emphasis on SEE countries:

- Focus on productive investments that create jobs.
- Strengthen fiscal transparency and reduce unproductive spending.
- Use EU funds and international aid for structural reforms.
- Focus on debt sustainability while simultaneously creating new jobs.

Year 2026, Issue 32: 23-37
DOI: 10.7251/ZREFIS2632023B

The results of the empirical analysis confirmed the basic research hypothesis - that the increase in public debt has a statistically significant effect on the growth of the short-term increases in unemployment rate in SEE countries. With this finding, the paper contributes to the literature that emphasizes the negative effects of public debt on the labor market in developing and transition countries. The remaining two research questions and hypotheses were not tested with a regression model, but were dealt with qualitatively through descriptive and comparative analysis. The results suggest that the short-term relationship between public debt and unemployment is stronger in crisis periods, and that institutional factors and EU membership moderate the negative effects of public debt. Although these findings cannot be considered formally confirmed, they represent an important direction for future research that would more deeply analyze the interaction between public debt, the labor market and the institutional framework in the region.

However, the research has certain limitations. Due to the lack of data, Kosovo* and Montenegro were not included in the analysis, which somewhat reduces the representativeness of the results. The model includes only basic macroeconomic variables (public debt, GDP per capita and inflation), while other important factors such as fiscal deficit or political stability are not included. The results refer exclusively to SEE countries and cannot be fully generalized to other regions.

Future research directions could include expanding the analysis to a larger number of countries and periods, introducing additional economic and institutional variables, and applying dynamic models such as GMM to reduce the endogeneity problem. Formal testing of the effects of crisis periods and institutional factors, including EU membership, would give an even deeper insight into the mechanisms through which public debt is associated the labor market. Future research could extend this framework by incorporating panel cointegration techniques and dynamic specifications in order to explore long-run interactions between public debt and unemployment.

Overall, the paper confirms the basic hypothesis (H1) and at the same time opens up space for additional studies. This achieves a balance between quantitative evidence and a broader qualitative understanding of the complex relationship between public debt and unemployment in SEE countries. These results offer a valuable contribution to the literature and at the same time open up space for future research that would more deeply analyze the interaction between public debt, the labor market, crisis periods and the institutional framework in the region. It should be emphasized that the findings of this study are limited to short-run relationships due to the use of first-differenced data and the absence of panel cointegration testing. Therefore, the results should be interpreted with caution and not as evidence of long-term causal effects.

REFERENCES

Alnaa, Samuel Erasmus, and Juabin Matey. 2023. "Dynamic Relationship Between External Debt and Unemployment in Sub-Saharan Africa." *Theoretical and Applied Economics* 30 (1): 137–152.

Babajić, Amra, and Mirza Suljić. 2024. "Public Debt and Economic Growth Nexus: Dynamics in Bosnia and Herzegovina." *BH Ekonomski forum* 20 (1): 35–50. https://doi.org/10.62900/BHEF242001002.

Bexheti, Abdylmenaf, Luljeta Sadiku, and Murat Sadiku. 2020. "The Impact of Public Debt on Economic Growth: Empirical Analyses for Western Balkan Countries." In *Economic and Financial Challenges for Balkan and Eastern European Countries*, edited by Marietta Janowicz-Lomott, Krzysztof Łyskawa, Persefoni Polychronidou, and Anastasios Karasavvoglou, 13–32. Cham: Springer. https://doi.org/10.1007/978-3-030-39927-6_2.

Checherita-Westphal, Cristina, and Philipp Rother. 2010. "The Impact of High and Growing Government Debt on Economic Growth: An Empirical Investigation for the Euro Area." *ECB Working Paper Series* no. 1237. Frankfurt am Main: European Central Bank. https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1237.pdf

Coccia, Mario. 2012. "What Are the Effects of Public Debt on Innovation and Employment Growth?" *CERIS Working Paper* no. 6/2012. https://doi.org/10.2139/ssrn.2581727.

Dombi, Ákos, and István Dedák. 2019. "Public Debt and Economic Growth: What Do Neoclassical Growth Models Teach Us?" *Applied Economics* 51 (29): 3104–3121. https://doi.org/10.1080/00036846.2018.1508869.

IMF. 2021. *Fiscal Monitor*. Washington, DC: International Monetary Fund. Accessed September 20, 2025. https://www.imf.org/en/Publications/FM.

IMF. 2025. *IMF DataMapper: Datasets*. Washington, DC: International Monetary Fund. Accessed September 12, 2025. https://www.imf.org/external/datamapper/datasets.

Jahan, Sarwat, Ahmed Saber Mahmud, and Chris Papageorgiou. 2014. "What Is Keynesian Economics?" *Finance & Development* 51 (3): 53–54.

Keynes, John Maynard. 1936. *The General Theory of Employment, Interest, and Money*. London: Macmillan.

Kumar, Manmohan S., and Jaejoon Woo. 2010. "Public Debt and Growth." *IMF Working Paper* 10 (174): 1–46. https://doi.org/10.5089/9781455201853.001.

Mencinger, Jernej, Aleksander Aristovnik, and Miroslav Verbič. 2014. "The Impact of Growing Public Debt on Economic Growth in the European Union." *Amfiteatru Economic Journal* 16 (35): 403–414. https://hdl.handle.net/10419/168832.

Mihaiu, Diana Marieta. 2014. "Analysis of Public Debt in the European Union: Issues Related to Its Sustainability." *Journal of International Studies* 7 (2): 25–32. https://doi.org/10.14254/2071-8330.2014/7-2/2.

Reinhart, Carmen M., and Kenneth S. Rogoff. 2010. "Growth in a Time of Debt." *American Economic Review* 100 (2): 573–578. https://doi.org/10.1257/aer.100.2.573.

Salmon, Jack. 2025. "The Impact of Public Debt on Economic Growth: What the Empirical Literature Tells Us." George Mason University, Mercatus Center. Accessed September 16, 2025. https://www.mercatus.org/research/policy-briefs/impact-public-debt-economic-growth-what-empirical-literature-tells-us.

Sengupta, Swapnanil, Jayanta Talukder, and Aakansha Atal. 2025. "Between Keynesianism and Neoclassicism: A Comparative Analysis of Public Debt-Unemployment Nexus Across Continents." *Development and Sustainability in Economics and Finance* 5 (1): 100036. https://doi.org/10.1016/j.dsef.2024.100036.

Spadafora, Francesco, Emidio Dombizza, and Andrea Colabella. 2011. "The Impact of the Global Crisis on South-Eastern Europe." *IMF Working Paper* 11 (300). https://doi.org/10.5089/9781463927868.001.

Tang, Daniel, and Haruna Issahaku. 2024. "Public Debt and Unemployment in Sub-Saharan Africa: The Role of Institutional Framework." *SN Business & Economics* 4 (3): 1–26. https://doi.org/10.1007/s43546-024-00628-3.

Turrini, Alessandro. 2013. "Fiscal Consolidation and Unemployment: Does EPL Matter? A Look at EU Countries." *IZA Journal of Labor Policy* 2 (8). https://doi.org/10.1186/2193-9004-2-8.

World Bank. 2023. *South East Europe Regular Economic Report*. Washington, DC: World Bank. Accessed September 5, 2025. https://www.worldbank.org/en/region/eca/publication/south-east-europe-regular-economic-report.

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
UDC 339.732:336.143.232(4)
DOI: https://doi.org/10.7251/ZREFIS2632037G
Original scientific paper

Year 2026, Issue 32: 39-49
Received: 28th February 2026
Revised: 26th March 2026
Accepted: 24th March 2026
Published: 23th June 2026

Mikhail Gozhev 0009-0006-0350-0854 ✉ xgozhev@uniag.sk
Faculty of European Studies and Regional Development, Slovak University of Agriculture in Nitra, Slovakia
Martin Mariš 0000-0001-8276-3308 ✉ martin.maris@uniag.sk
Institute of Regional and Rural Studies, Slovak University of Agriculture in Nitra, Slovakia

THE INCOME GAP BETWEEN ADVANCED, EMERGING, AND DEVELOPING ECONOMIES: EVIDENCE FROM PANEL DATA

ДОХОДОВНИ ЈАЗ ИЗМЕЂУ РАЗВИЈЕНИХ, ТРЖИШТА У НАСТАЈАЊУ И ЗЕМАЉА У РАЗВОЈУ: ДОКАЗИ ИЗ ПАНЕЛ ПОДАТАКА

Summary: *The sustainability of the global economic growth poses the grave challenge for policymakers, academia and business. The main objective of the study was evaluation of income differences across the country groups over 2001-2024 period. The results point on statistically significant income differences between the country groups of GN and BRICS+ and GS, however not between the BRICS+ and GS. According to results the per capita income in GN countries are 3,3 times higher than in BRICS+ countries on average. In turn the GS countries are about 37% poorer than BRICS+ countries on average, however the result is not statistically significant. Finally pointing on income-growth dynamics across the countries the uneven pattern between the country blocs emerges. The GN countries are characterized by high-low pattern (e..g. high income, low growth); whereas BRICS+ and GS countries are characterized rather by low-moderately strong and low-strong pattern (e.g. low income; higher growth). Whereas the catch-up effect could not be ruled out, it depends about income and wealth redistribution policies in these countries.*
Keywords: *sustainability, economic growth, income, GN countries, GS countries, BRICS+*
JEL Classification: *O15,R11*

Резиме: *Одрживост глобалног економског раста представља озбиљан изазов за носиоце јавних политика, академску заједницу и пословни сектор. Главни циљ овог истраживања био је да се оцијене доходовне разлике између група земаља у периоду 2001–2024. године. Резултати указују на статистички значајне разлике у дохотку између земаља Глобалног сјевера (ГН) и БРИКС+ земаља, као и између земаља Глобалног сјевера и Глобалног југа (ГС), док разлике између БРИКС+ земаља и земаља Глобалног југа нису статистички значајне. Према резултатима, доходак по становнику у земљама Глобалног сјевера у просјеку је 3,3 пута већи него у БРИКС+ земљама. С друге стране, земље Глобалног југа су у просјеку око 37% сиромашније од БРИКС+ земаља, али овај резултат није статистички значајан. Коначно, анализа динамике дохотка и раста указује на неуједначене обрасце између посматраних блокова земаља. Земље Глобалног сјевера карактерише образац високог дохотка и ниског раста, док БРИКС+ земље и земље Глобалног југа карактеришу обрасци нижег дохотка и умјерено снажнијег, односно снажнијег раста. Иако се ефекат сустизања не може искључити, његово остваривање зависи од политика прерасподјеле дохотка и богатства у овим земљама.*
Кључне ријечи: *одрживост, економски раст, доходак, земље Глобалног сјевера, земље Глобалног југа, БРИКС+*
ЈЕЛ касификација: *O15,R11*

Paper presented at the 15th International Scientific Conference ''Jahorina Business Forum 2026: Regional and Local Development in the Context of Reindustrialization and Green Transition"

INTRODUCTION

The gap between the richest 10% and the poorest 10% of the population is a key indicator of socioeconomic sustainability and requires special attention. It reflects not only issues of "equity" in income distribution within a country, but also the quality of institutions, the structure of labor markets, access to human capital, and the economy's ability to translate growth into shared **(**Sitthiyot and Holaust 2020).

It is important to note that discussing inequality solely in terms of "the incomes of the rich and the poor" is often insufficient. In applied research, incomes and living standards are measured and compared both across individual countries and across groups of countries. In this logic, the central question becomes: how different countries and blocs (the Global North, the Global South, BRICS+) shape the conditions under which the relationship between the top and bottom deciles is formed and reproduced.

Global inequality – the gap between Global North and the Global South has grown for the first time in 25 years. Low and lower-middle income countries are set to pay nearly half a billion US dollars a day in interest and debt payments between now and 2029, and they are having to make severe cuts to spending to be able to pay their creditors. Meanwhile, the dramatic increase in extreme wealth witnessed since 2020 has become set in stone. This wealth is concentrated in the Global North. Only 21% of humanity lives in the countries of the Global North, but these countries are home to 69% of private wealth, and 74% of the world's billionaire wealth **(**Oxfam 2024).

However, still emerging and even developing economies have been building up their own wealth elites. The UBS in its Global Wealth report points that the world became richer in 2024 but it's a mixed picture. After a decline in 2022, global wealth rose again in 2024 on the heels of a buoyant 2023. In 2023, the rebound in wealth was led most strongly by growth in Europe, the Middle East and Africa. By contrast, in 2024 wealth growth was tilted strongly towards North America, driven by a stable US dollar and upbeat financial markets (UBS, 2025).

In this article, we briefly review the historical evolution of inequality (from agrarian societies to the global economy). We then examine contemporary income differences between country blocs and their relationship to the economic geowth. Finally, in the discussion and conclusion, we explore the reasons for the persistence of these gaps and how they are influenced by growth, investment, and convergence.

The provided dataset contains GDP per capita data for 199 countries (2000–2024). These data do not directly measure decile incomes within countries; they are particularly useful for describing the macroeconomic environment in which decile gaps arise (the overall "size of the economic pie," government fiscal capacity, investment opportunities, etc.).

1. LITERATURE OVERVIEW

1.1 Historical Context: How the Logic of Inequality Has Changed

In agrarian systems, wealth was based primarily on land and control over rent. Upper classes (the elite, large landowners, and ruling classes) enjoyed stable advantages secured by law, tradition, and power. Lower classes lived in conditions of low productivity and income, but were highly vulnerable to shocks (crop failures, wars, and disease) and faced almost complete lack of mobility (Carocci 2011).

It is crucial to note that social mobility was limited: poverty and wealth were often reproduced through birth and status.

The industrialization of society created the basis for the gap between deciles: in the early stages, the return on capital (enterprises, finance, infrastructure) began to grow faster than the return on labor. Historical examples (19th-century Great Britain, the United States during its early industrialization, the Russian Empire) illustrate a typical trajectory: rapid growth in production and national wealth can coincide with high social polarization, when income redistribution and labor protection are very weak, de-facto nonexistent, or extremely poorly provided **(**Lindert and Nafziger 2014).

Year 2026, Issue 32: 39-48
DOI: 10.7251/ZREFIS2632037G

After two world wars, many developed countries created mechanisms that partially narrowed the gap within society: progressive taxation, expanded education, social benefits, stronger trade unions, and accessible healthcare. This made it possible to form a broad middle class and reduce the scale of poverty among the overwhelming majority of the population **(**Palme 2006**)**.

Since the 1980s, trends that often lead to a widening gap between the "upper" and "lower" strata of the population have intensified: global capital mobility, the growing role of financial assets, the skills premium driven by technological advances, and rising housing and asset prices. At the same time, globalization has stimulated growth in parts of the developing world where poverty was endemic and there was no possibility of changing the situation without external changes, creating a dual picture: partial convergence between countries can coexist with increasing inequality within countries **(**Dollar 2005).

Our research uses the "Global North," "Global South," and BRICS+ blocs, a classification increasingly referenced not only in policy discussions but also in academic ones. This classification is useful because it links economies to historical development paths, colonial legacies, institutional models and state capacity, each bloc's position in global value chains, investment potential and demographic dynamics, and the potential for convergence - catch-up development (Seniuk 2019).

An important note: the boundaries of these blocs are not always clear-cut (for example, high-income economies based on the financial sector or resources may be considered as the “South” in a political-geographical sense). Therefore, it is more accurate to view them as analytical frameworks rather than as rigid natural categories.

In the Global South, the range of indicators is extremely wide, encompassing both very low-income countries and high-income countries (often driven by resource extraction or finance). This has a crucial impact on deciles: the same deciles do not imply the same conditions for the bottom decile. In some countries, poverty is linked to survival and access to basic needs, while in others, it is linked to housing affordability, job quality, and overall inequality in asset distribution (Ahmad 2025).

1.2. Historical Perspective by Bloc and Current Issues: Growth, Investment, Convergence

Historically, many economies in the wealthy countries of the Global North industrialized earlier and developed strong institutions and human capital. This ensures high per capita GDP and a greater ability of the state to support low-income groups through public subsidies. However, in recent decades, many countries in the North have faced the growing role of capital income (stocks, housing) and asset concentration in the top decile, technological polarization of labor markets (skill premiums), a housing affordability crisis in large cities, political sensitivity to migration, and "inequality of opportunity." (Piketty and Zucman, 2014).

The logic of deciles in the Global North: the bottom decile may have relatively good access to basic services by world standards, but soaring housing costs, job insecurity, and weak real income growth can exacerbate feelings of alienation from the top decile.

BRICS+ is of significant analytical importance because it brings together large populations and markets (India, China), resource and energy production centres (Russia, Saudi Arabia, Iran), and regional leaders (Brazil, South Africa, Egypt, Ethiopia, UAE). Its potential for convergence depends on infrastructure investment, productivity growth, industrialization, reindustrialization, human capital and technology development, and integration into international trade and logistics. However, catch-up growth is constrained by institutional risks, sanctions and geopolitics (for some members), commodity dependence and

Year 2026, Issue 32: 39-48
DOI: 10.7251/ZREFIS2632037G

rent traps, uneven modernization across regions, large gaps between formal and informal labor markets (especially in large developing member countries), and unequal access to education and healthcare **(**Ncwadi 2025).

The logic of deciles in BRICS+: even with rising GDP per capita, the bottom decile may grow slowly if growth is concentrated in capital-intensive sectors, megacities, or among groups with privileged access to education and assets.

1.3. Global South: diversity of trajectories and "bottlenecks" for convergence

Countries in the Global South represent very different models: from fast-growing export economies to countries struggling with conflict, demographic pressure, weak fiscal bases, and low productivity.

Factors that facilitate growth include investment in basic infrastructure (energy, transport, communications), improved education and healthcare, strengthened institutions, integration into global value chains, urban development, and labor market development **(**Ndubuisi and Owusu 2023).

Factors that limit progress include low agricultural productivity, large informal sector employment, weak institutions and limited opportunities for wealth redistribution, external shocks (commodity prices, climate, debt burden), brain drain, and capital shortages.

2. DATA AND METHODS

The primary objective of this paper is to examine the evolution of income disparities across countries from 2001 to 2024. Acknowledging the transition of various countries, three principal groups were outlined in line with the IMF's classification. The Global North (GN) comprises advanced economies; the BRICS+ are considered emerging economies; and the Global South comprises both emerging and developing economies. For comparison, the real GDP per capita in PPP was used over the 2001-2024 period. As a data sample, the World Bank public database was used. Data processing and statistical inference were performed in Stata.

As the primary research method, linear panel regression with dummy variables was employed. Formally, we may write:

$$lnY_{ij} = \alpha + \beta_{ij1} GN + \beta_{ij2} GS + year_{ij} + u_{ij} \qquad (1.0)$$

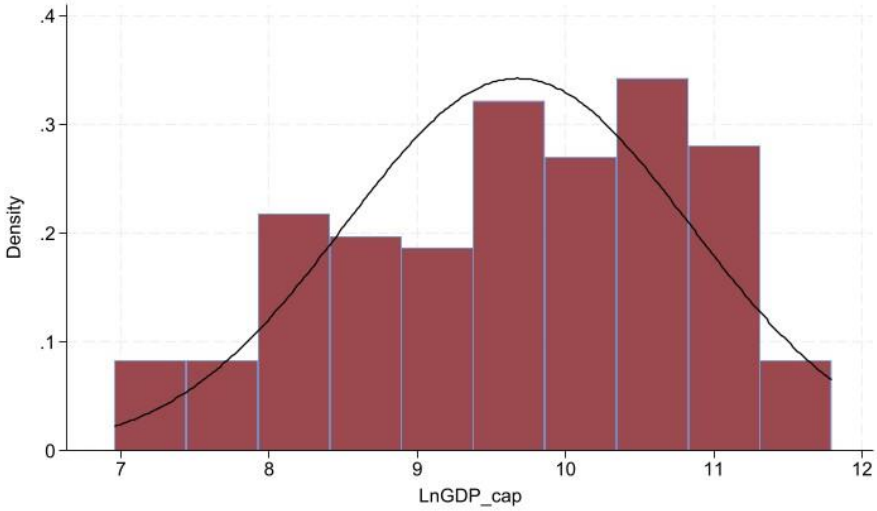
Where Y is dependent variable (e.g. GDP per capita in logarithm), GN- dummy variable (Global North), GS - dummy variable (Global South), where the BRICS+ is considered as a reference category, year and u – represents the error term over i- country and j-period. We consider that model should fill attributes of the classical regression model. The model would reveal the group-level income differences over the researched period. As a main estimation method panel model with random effects using robust estimators are preferred. Additionally diagnostics of the model is provided in the annexe part.

Year 2026, Issue 32: 39-48
DOI: 10.7251/ZREFIS2632037G

3. RESULTS

For the research purposes we present the basic statistical diagnostic of data. The histogram shows the probability distribution of data sample, the logarithm of GDP per capita in PPP in 2024.

Fig.1: Probability distribution of Ln GDP per capita in 2024



Source: author's processing based on World Bank 2026

The Fig.1 the probability distribution of data sample. We may consider departure from the normal distribution. It may be observed multimodal, slightly left-skewed distribution of GDP per capita in PPP across the countries in 2024 respectively.

Next, the main results showing the group-level income differences are presented. Table 1, shows income level comparisons between the country groups (GN, GS) using the BRICS+ as the reference group.

Table 1: Regression results

GDP_cap	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Country_group : ba~+	0	.	.	.	.	.	
GN	1.207	.314	3.84	0	.591	1.822	***
GS	-.471	.321	-1.46	.143	-1.1	.159	
2002	.02	.004	5.07	0	.012	.027	***
2008	.218	.015	14.22	0	.188	.248	***
2014	.3	.021	14.27	0	.259	.341	***
2020	.326	.026	12.66	0	.275	.376	***
2024	.45	.03	15.12	0	.392	.509	***
Constant	9.336	.313	29.83	0	8.723	9.949	***

Mean dependent var	9.488	SD dependent var	1.182
Overall r-squared	0.345	Number of obs	4717
Chi-square	1521.045	Prob > chi2	0.000
R-squared within	0.431	R-squared between	0.336

**** p<.01, ** p<.05, * p<.1*

Adjusted predictions Number of obs = 4,717
Model VCE: Robust
Expression: Linear prediction, predict()

	Delta-method					
	Margin	std.	err.	z	P>z	[95% CI]
cnr_gr						
BRICS+	9.591	0.308	31.100	0.000	8.987	10.196
GN	10.797	0.054	198.190	0.000	10.691	10.904
GS	9.123	0.087	104.510	0.000	8.952	9.294

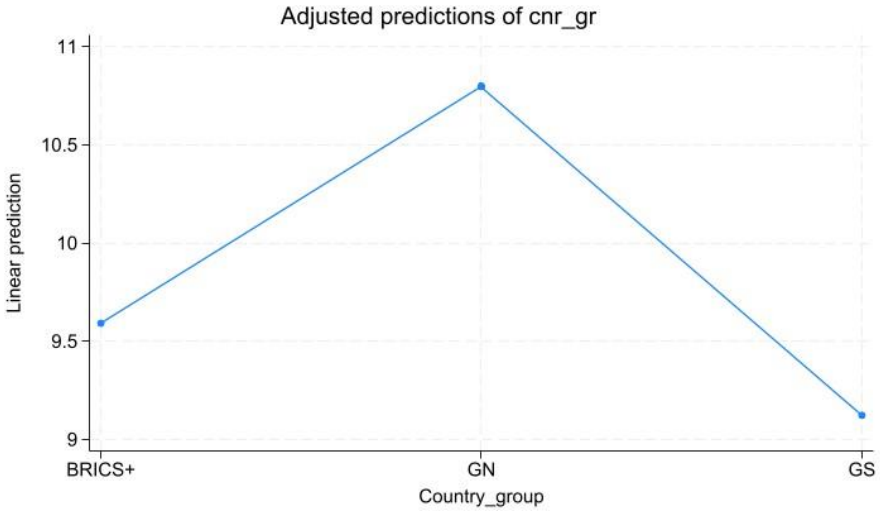
Source: author's research

The constant represents the mean income of the BRICS+ countries, whereas the coefficients represent the income difference relative to BRICS+. Interestingly, in case of GN countries have GDP per capita in PPPs higher by 1.206 units relative to BRICS+, meaning $e^{1.206} \approx 3.34$, so GN countries are roughly 3.3 times richer than BRICS+ in average. The result is statistically significant. In case of GS countries, they have GDP per capital in PPPs lower by 0.468 log points than BRICS+, meaning $e^{-0.468} \approx 0.63$, hence GS countries are 37% poorer than BRICS+ on average, however the result is not statistically significant. The unit panel root was not detected. Additionally, several years as regressors were introduced confirming statistically significant difference of the GDP per capita in average over the selected time periods.

In the annexe 1, results of the Breusch-Pagan LM test is presented. The Breusch-Pagan LM has confirmed that the random effects model should be preferred over the pooled OLS, thereby providing better statistical inferences.

The table below shows the mean-level differences the country groups. The income-groups differences are all statistically significant. We may observe the differences through the marginplots.

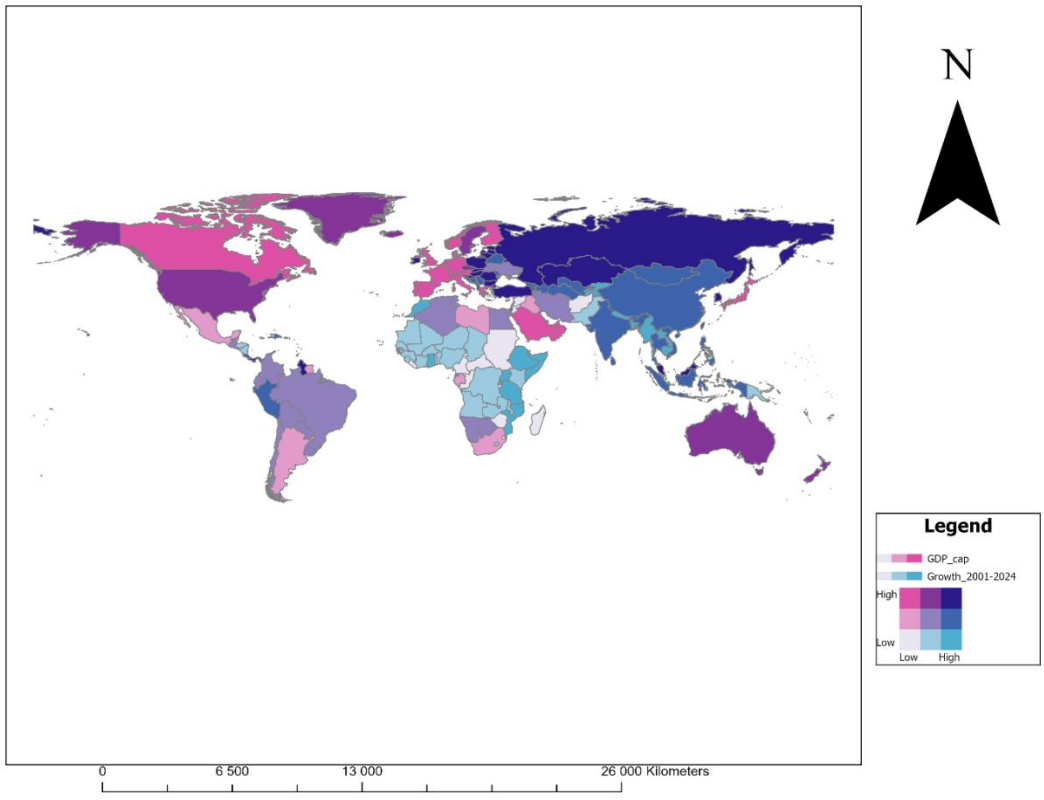
Fig.2: The marginplot of income-group differences



Source: author's research

The Fig.2 shows the marginplot of income-group differences. We may observe a meaningful differences between the country groups. On average the highest income represent the Global North countries (10,79) , in second come BRICS+ (9,591) group and finally the group of the Global South countries (9,23) measured as real GDP per capita in PPPs expressed in logarithms in 2024.

Fig.3: Global distribution of income and growth



Source: author's research

The Fig. 3 shows the global distribution of income and economic growth averaged over 2001-2024 over world countries. The choropleth map combines the income measures as real GDP per capita in PPS (in 2024) with average economic growth over the 2001-2024. The overall picture shows relatively mixed patterns. The GN countries mostly records high-low pattern, meaning high levels of income but low levels of growth, BRICS+ countries often represent the mixed pattern consisting of mediocre income and moderate-high economic growth. GS countries mostly record low-medium to low-high pattern, meaning low income but medium to high growth.

4. DISCUSSION

Gaps between deciles are formed against the background of the level of GDP per capita, the state's ability to redistribute wealth and resources, the structure of employment and productivity of the population, as well as access to education and capital.

Our dataset shows that differences between the blocs persist, but partial convergence is observed: the median indicator for countries in the Global South has increased from approximately 15% of the median indicator for countries in the North (2000) to 23% (2024). This is an important empirical finding for discussions about catch-up development in these countries.

Even when a country or bloc's economy is developing, the gap between deciles may narrow (if growth is inclusive and institutions are strong), remain stable, or widen (if growth is capital-led, concentrated in megacities, or driven by high-skill sectors). From a policy perspective, this means that cross-country convergence in GDP per capita does not guarantee convergence in social structure. For BRICS+ countries and some countries in the Global

South, it's not just the "higher volume of investment" that matters, but also the type of investment: investment in infrastructure and human capital increases the likelihood that the bottom decile will gain access to productive jobs. Investments concentrated in rent-seeking or capital-intensive sectors with weak links to the labor market often only exacerbate the gap between deciles and have no impact on the well-being of the majority **(**Ofori et al. 2024).

On average, countries in the Global North have stronger institutional instruments to support the poorest groups (tax deductions, subsidies, and a wide range of public services). However, the gap can widen due to the concentration of assets in the hands of corporations or wealthy individuals, as well as rising housing costs. In countries in the Global South and some BRICS+ countries, institutions often become a major bottleneck. With weak state capacity and a narrow tax base, even high economic growth may not lead to sustainable improvements in the situation of the bottom decile.

CONCLUSION

The relationship between the richest and poorest deciles cannot be fully understood and assessed without a country- and block-level approach, especially when empirical analysis is structured around groups of countries. Historically, inequality changes its forms over time, but essentially persists as a result of the interaction of technology, capital, institutions, and labor market structure.

The main objective of the paper was evaluation of income disparities between the global economies over 2001-2024 period. For simplification the country economies were aggregated into the three country blocks for providing the exact measuring. For the study purposes the cross-sectional data over countries and time series data over 2001-2024 were pooled to the panel using real GDP per capita in PPPs as a dependent variable and country groups dummy variables as control variables. The results point at statistically significant income differences between the GN vs. GS and BRICS+, but there was not statistically significant difference between the BRICS+ vs. GS.

Finally, the comparison between the economic growth and income across the countries shows the mixed pattern, pointing on slow growth of GN countries, whereas BRICS+ and GS countries logged mostly moderate strong to strong economic growth in average. Hence, the catch-up effect between the BRICS+, GS countries and GN countries could no be ruled out over time, however it depends on the wealth and income distribution over the population in these countries.

However, these signs of convergence do not automatically imply a narrowing of the gap between the top and bottom deciles within countries. In many cases, economic growth enhances the role of capital income and skill-enhancing technological change, potentially widening the gap between income extremes across deciles. Therefore, the key question is not just "how fast are we growing economically" but also what is the structure of growth, which investments dominate, and how strong are the domestic institutions that translate growth into access to opportunity.

For countries in the Global North, the central challenge is maintaining social cohesion in the face of rising asset prices and labor market polarization. For BRICS+ and Global South countries, the primary challenge is accelerating productivity growth while creating institutional conditions under which investment and modernization generate broad employment effects, improve education and health outcomes, and support social mobility. In this sense, the analysis of gaps between deciles naturally leads to the broader issue of how different trajectories of development of the bloc structure are and how the benefits of growth are distributed between society and the elites.

Year 2026, Issue 32: 39-48
DOI: 10.7251/ZREFIS2632037G

REFERENCES

Ahmad, S. 2025. "Income, Employment, and Housing Inequalities in Asian and African Cities." In *Urban Inequality in the Global South*, edited by Y. P. Wang, D. Rukmana, and S. Ahmad, 349–379. Singapore: Springer. https://doi.org/10.1007/978-981-96-5629-5_14.

Carocci, S. 2011. "Social Mobility and the Middle Ages." *Continuity and Change* 26 (3): 367–404. https://doi.org/10.1017/S0268416011000257.

Dollar, D. 2005. "Globalization, Poverty, and Inequality since 1980." *The World Bank Research Observer* 20 (2): 145–175. https://doi.org/10.1093/wbro/lki008.

Lindert, P. H., and S. Nafziger. 2014. "Russian Inequality on the Eve of Revolution." *The Journal of Economic History* 74 (3): 767–798. https://doi.org/10.1017/S002205071400059X.

Ncwadi, R. 2025. "Rising Inequality or Regional Strength? Investigating Income Growth Divergence among BRICS Nations." *International Journal of Economics and Financial Issues* 15 (6): 412–424. https://doi.org/10.32479/ijefi.20595.

Ndubuisi, G., and S. Owusu. 2023. "Trade for Catch-Up: Examining How Global Value Chains Participation Affects Productive Efficiency." *Journal of Productivity Analysis* 59: 195–215. https://doi.org/10.1007/s11123-023-00663-6.

Ofori, P. E., C. B. Kuuwill, and S. K. Kutor. 2024. "Effect of Human Capital Development and Institutional Quality on Inclusive Growth in African Countries." *Cogent Economics & Finance* 12 (1): 2357155. https://doi.org/10.1080/23322039.2024.2357155.

Oxfam. 2024. *Inequality Inc.* Oxford: Oxfam GB. https://doi.org/10.21201/2024.000007.

Palme, J. 2006. "Welfare States and Inequality: Institutional Designs and Distributive Outcome." *Research in Social Stratification and Mobility* 24 (4): 387–403. https://doi.org/10.1016/j.rssm.2006.10.004.

Piketty, T., and G. Zucman. 2014. "Capital Is Back: Wealth-Income Ratios in Rich Countries, 1700–2010." *The Quarterly Journal of Economics* 129 (3): 1255–1310. https://doi.org/10.1093/qje/qju018.

Seniuk, N. 2019. "BRICS Countries in Global Value Chains." *Strategic Analysis* 43 (6): 509–531. https://doi.org/10.1080/09700161.2019.1669900.

Sitthiyot, T., and K. Holasut. 2020. "A Simple Method for Measuring Inequality." *Humanities and Social Sciences Communications* 7: 103. https://doi.org/10.1057/s41599-020-0484-6.

UBS. 2025. *Global Wealth Report 2025*. Zurich: UBS Switzerland AG. https://www.ubs.com/global/en/wealthmanagement/insights/global-wealth-report.html.

ANNEX 1:

```
Breusch and Pagan Lagrangian multiplier test for random effects

        GDP_cap[ID_count,t] = Xb + u[ID_count] + e[ID_count,t]

        Estimated results:
                         |       Var     SD = sqrt(Var)
                ---------+-----------------------------
                 GDP_cap |   1.396254       1.181632
                       e |   .0223217       .1494043
                       u |   .8829713       .9396655

        Test: Var(u) = 0
                             chibar2(01) = 50312.51
                          Prob > chibar2 =   0.0000
```

PRELIMINARY COMMUNICATIONS

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
UDC 005.334:336.71(497.16)
DOI: https://doi.org/10.7251/ZREFIS2632051P
Preliminary Communication

Year 2026, Issue 32: 51-62
Received: 27th February 2026
Revised: 2nd March 2026
Accepted: 24th March 2026
Published: 23th June 2026

Nemanja Popović 0009-0003-5686-9362 ✉ nemanja.p@ucg.ac.me
Faculty of Economics Podgorica, University of Montenegro, Montenegro

Milena Konatar 0000-0002-9684-4376 ✉ milena.radonjic@live.com
Faculty of Economics Podgorica, University of Montenegro, Montenegro

Milivoje Radović 0009-0004-1886-3725 ✉ rmico@ucg.ac.me
Faculty of Economics Podgorica, University of Montenegro, Montenegro

Dino Kožar 0009-0006-1067-5126 ✉ nodezo93@gmail.com
Faculty of Economics Podgorica, University of Montenegro, Montenegro

CLIMATE-RELATED PHYSICAL RISKS AND BANKING SECTOR RESILIENCE: A MACROPRUDENTIAL PERSPECTIVE

КЛИМАТСКИ ФИЗИЧКИ РИЗИЦИ И ОТПОРНОСТ БАНКАРСКОГ СЕКТОРА: МАКРОПРУДЕНЦИЈАЛНА ПЕРСПЕКТИВА

Summary: *This study analyses the impact of climate-related physical risks, with a particular focus on floods, on the financial and macroeconomic stability of Montenegro. Using regression models and stress-test scenarios, the paper examines the relationship between climate shocks and key indicators such as the share of non-performing loans (NPLs), GDP growth, and banks' capital adequacy ratio (CAR). The findings indicate that extreme climate events significantly increase credit risk, which is reflected in higher NPLs, lower CAR, and adverse effects on economic growth. The simulations suggest that a severe climate shock could double the level of NPLs and substantially undermine banking-sector stability, with potentially broader implications for the fiscal sector and insurance companies. The results confirm that climate risks should be integrated into macroprudential policies, supervisory frameworks, and risk-management strategies, particularly in small and open economies.*
Keywords: *climate risks, financial stability, non-performing loans (NPLs), capital adequacy ratio (CAR), Montenegro.*
JEL Classification: *G21, C53, Q54.*

Резиме: *Ово истраживање анализира утицај физичких климатских ризика, са посебним фокусом на поплаве, на финансијску и макроекономску стабилност Црне Горе. Коришћењем регресионих модела и стрес тест сценарија, испитује се повезаност између климатских шокова и кључних индикатора као што су удио ненаплативих кредита (НПЛ), стопа раста БДП-а и капитална адекватност банака (ЦАР). Резултати указују да екстремни климатски догађаји значајно повећавају кредитни ризик, што се манифестује растом НПЛ-а, падом ЦАР-а и негативним ефектима на економски раст. Симулације показују да би озбиљан климатски шок могао удвостручити НПЛ и значајно нарушити стабилност банкарског сектора, уз могуће шире импликације на фискални сектор и осигуравајућа друштва. Налази потврђују да климатски ризици морају бити интегрисани у макропруденцијалне политике, супервизорске оквире и стратегије управљања ризицима, посебно у малим и отвореним економијама.*
Кључне ријечи: *климатски ризици, финансијска стабилност, ненаплативи кредити (НПЛ), капитална адекватност (ЦАР), Црна Гора*
ЈЕЛ касификација: *G21, C53, Q54.*

Paper presented at the 15th International Scientific Conference ''Jahorina Business Forum 2026: Regional and Local Development in the Context of Reindustrialization and Green Transition"

INTRODUCTION

As Carney (2015) points out, even the destructive effects of climate change already being observed today may appear modest when compared with potential future shocks, which may have global consequences for food security, access to water, migration, and political stability.

For precisely this reason, an increasing number of central banks around the world recognise the need to develop tools that enable a more accurate assessment of climate risks and their potential impact on financial stability. One of the key instruments in this regard is climate-risk stress testing, which essentially represents a scenario-based analysis of extreme climate events or abrupt policy changes designed to simulate their effects on the banking, financial, and broader economic sectors of a country.

Advanced economies, including euro-area countries, the United States, and the United Kingdom, have already begun implementing such instruments, whereas most developing countries, including Montenegro, have not yet established adequate methodological frameworks.

1. LITERATURE REVIEW

Recent research has paid particular attention to the impact of climate risks on banks' asset quality, especially through the non-performing loans (NPL) indicator. Evidence from European Union countries suggests that greater exposure to physical climate risks leads to a statistically significant increase in the share of NPLs in total credit portfolios (Delis et al. 2024). Similar results are reported in a study by the Central Bank of Mexico, which shows that chronic physical risks may cause losses exceeding 35% of GDP by the end of the century, with the financial sector being particularly affected through the deterioration of borrowers' repayment capacity (Estrada et al. 2024).

The adverse impact of rising NPLs on macroeconomic indicators, particularly GDP growth, has been confirmed in several studies. According to Klein (2013), a higher share of non-performing loans negatively affects economic growth because banks reduce lending activity, which in turn lowers investment and consumption. The same effect was observed by Louzis, Vouldis, and Metaxas (2011), who used a dynamic panel model to analyse peripheral euro-area economies. Messai and Jouini (2013) further emphasise that GDP growth is negatively associated with NPLs, while unemployment and real interest rates are positively associated with the growth of non-performing loans.

At the same time, an increase in the level of NPLs directly affects banks' capital adequacy, which may threaten financial stability. A World Bank study (2024) found that a chronic physical shock, such as drought, may reduce the CAR by an average of about 2.2 percentage points over a five-year simulation horizon, while extreme floods reduce CAR by approximately 0.14 percentage points per year on average.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

In the economic literature, climate risks are typically divided into three broad categories: physical risks, transition risks, and, increasingly, liability risks (Campiglio et al. 2018; Zhou et al. 2023). Physical risks arise from more frequent and more intense extreme weather events, such as floods, droughts, hurricanes, and fires. These events directly affect the real economy, reduce the value of assets, and threaten loan repayment. Transition risks, by contrast, arise from the process of economic adjustment and the shift towards a green economy. They include policy, regulatory, and technological changes that may disrupt the stability of existing business models. The third dimension of climate risk, liability risk, refers to the legal and financial consequences that may arise if institutions, firms, or states are held responsible for environmental damage (Zhou et al. 2023).

Year 2026, Issue 32: 51-62
DOI: 10.7251/ZREFIS2632051P

The financial system has proven particularly vulnerable to climate risks because these risks threaten not only individual institutions but also the systemic coherence of the entire sector. Insurance companies, as financial intermediaries, are directly exposed to physical risks and have already recorded significant losses resulting from increasingly severe natural disasters. This study therefore starts from physical risks and examines how such an event may be transmitted through different financial and economic institutions and affect the welfare of a country.

To achieve this, it is necessary to develop a reliable methodological framework for climate-risk stress testing, tailored to the specific characteristics of the national financial system and institutional architecture.

3. RESEARCH METHODOLOGY

This paper applies a quantitative approach that combines regression analysis and scenario simulation, focusing on a physical risk, specifically the 2010 flood, which was recorded as the most destructive climate-related event in the recent history of Montenegro and whose consequences may significantly affect the financial system through various channels. A quasi top-down model was selected to analyse the relationship between a climate shock and credit risk through non-performing loans (NPLs), while controlling for macroeconomic variables such as inflation and unemployment.

3.1 Defining the Climate Stress-Test Model

This study applies a simplified quantitative climate stress-test model in order to assess the effect of a physical climate risk, specifically a flood, on the financial stability of Montenegro. The model is inspired by approaches used by the European Central Bank (ECB) and the Network for Greening the Financial System (NGFS), but it is adapted to the available macroeconomic data and the specific characteristics of the domestic financial system.

The share of non-performing loans (NPLs) was selected as the main indicator of financial-system sensitivity, as it measures credit risk and banking-sector resilience. The regression model is specified so that NPLs depend on a climate shock (a flood dummy variable), the inflation rate (to account for price-stability effects), and the unemployment rate (as an indicator of financial pressure on households and their capacity to repay debt). This model enables the isolation of the effect of the climate event, i.e. the 2010 floods that affected Montenegro, while controlling for macroeconomic factors that traditionally influence the growth of credit risk.

After analysing the available data and relevant sources, including the EM-DAT database and national statistics, 2010 was identified as the year in which Montenegro experienced the most severe flood in the last two decades. This event caused widespread consequences, including damage to housing, agriculture, and infrastructure, as well as measurable fiscal costs and effects on households' creditworthiness. For this reason, the dummy variable (flood_dummy) takes the value of 1 only for 2010, while it is set to 0 for all other years.

The data were collected from the websites of the Statistical Office of Montenegro (MONSTAT) and the World Bank for all available years, covering the period from 2007 to 2023. The regression model is presented in Table 1. The model was estimated using robust standard errors due to the small sample size and potential heteroskedasticity (Imbens and Kolesár 2016).

Year 2026, Issue 32: 51-62
DOI: 10.7251/ZREFIS2632051P

Table 1. Regression of NPL on the dummy variable, inflation, and unemployment

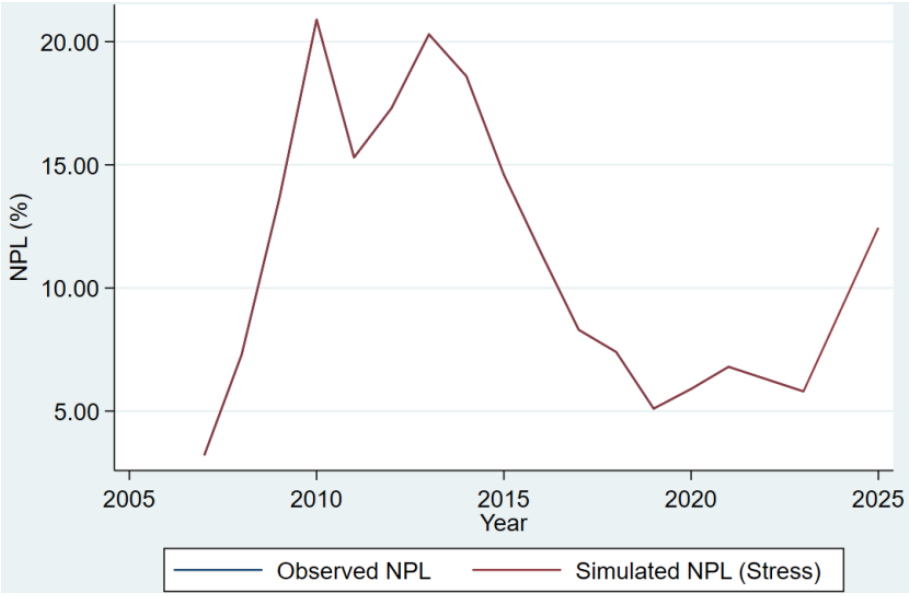
Linear regression	Number of observations	=	17	
	F (2, 13)	=	.	
	Prob. > F	=	.	
	R^2	=	0.4944	
	Root MSE	=	4.594	
Variable	**Coefficient**	**Robust std. error**	**t**	**P>|t|**	**95% confidence interval**
flood_dummy	6.6466	2.6239	2.53	0.025	0.9778 to 12.315
inflation	-0.0875	0.2733	-0.32	0.754	-0.6779 to 0.5028
unemployment	1.5659	0.6981	2.24	0.043	0.0577 to 3.0741
constant	-16.2989	11.9812	-1.36	0.197	-42.1828 to 9.5849

Source: Created by the author

The model shows that the 2010 flood had a statistically significant effect on the increase in the share of non-performing loans, amounting to 6.65 percentage points. This finding indicates a high degree of banking-sector sensitivity to physical climate risks and provides the basis for further stress testing. Inflation did not prove to be a statistically relevant variable, whereas unemployment has a positive and significant effect on NPLs, which is consistent with expectations: an increase in unemployment reduces borrowers' repayment capacity. The model's coefficient of determination is 0.49, indicating that the model explains approximately 49% of the total variability in the share of non-performing loans. Although this does not represent a high degree of explanatory power, the value is satisfactory for econometric analyses based on a limited number of observations and macroeconomic data that are often subject to numerous external influences not included in the model.

Based on the estimated flood effect on NPLs, a stress scenario was constructed in which a similar event is simulated for 2025. Under this scenario, the share of NPLs is assumed to increase by 6.65 percentage points relative to the 2023 value of 5.8%, producing a projected level of 12.45% for 2025. This implies a doubling of exposure to credit risk, with likely implications for banks' capital adequacy, liquidity, and macro-financial stability.

Figure 1. Flood stress test in 2025 for the NPL series



Source: Created by the author

The following section assesses the estimated effect of this shock on the GDP growth rate and on capital adequacy (CAR) in Montenegro for the same year.

The analysis was additionally strengthened by conducting a bootstrap regression and by estimating a lagged NPL regression model. Including the lagged level of NPLs makes it possible to control for the effect of past values on the current level of credit risk, thereby reducing the omitted-variable problem and producing a more precise estimate of the actual impact of floods on the quality of banks' loan portfolios. The extended dynamic model that includes lagged NPLs confirms the persistence of credit risk and the stability of the flood effect (Appendix 1).

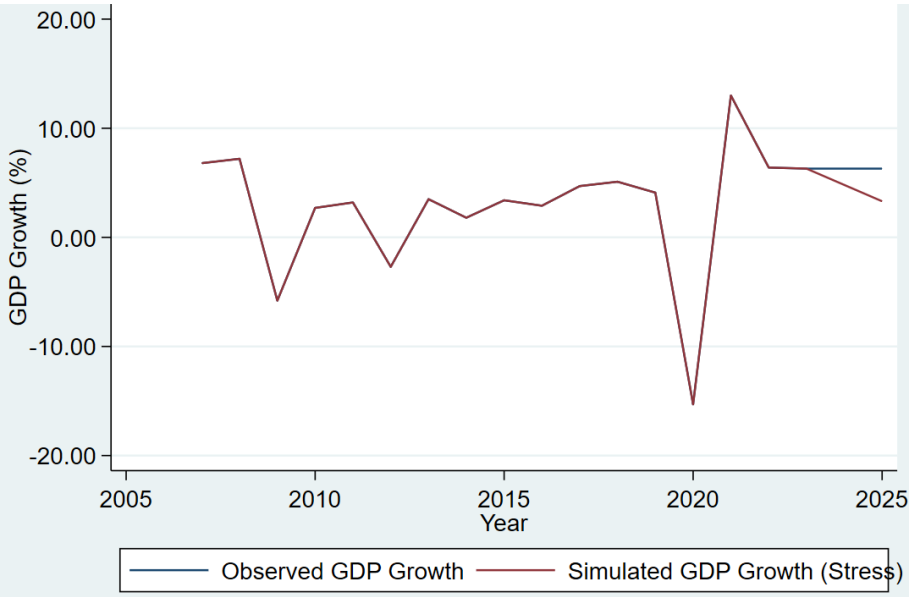
To test the robustness of the baseline model, a bootstrap regression with 1,000 replications was conducted; it did not change the significance of the main coefficients.

One of the key steps in the analysis was to use a quantitative model to examine how a climate shock, specifically a major flood, may affect the financial and macroeconomic stability of Montenegro. For this purpose, a regression model was formulated in which the GDP growth rate is the dependent variable, while the share of non-performing loans (NPLs), inflation, and unemployment are used as independent variables. To avoid overburdening the main text, the model is presented in Appendix 2.

This approach is consistent with the recommendations of several central banks and research institutions that use similar methods to better understand the potential macroeconomic effects of climate shocks (NGFS 2020; ECB 2021).

Specifically, the assumed physical climate shock, an extreme flood in 2025, was simulated through an increase in the share of non-performing loans from 5.8% to 12.45%, representing a shock of 6.65 percentage points. Based on the previously estimated relationship between NPLs and GDP growth, it was calculated that such an increase in NPLs could reduce the GDP growth rate in 2025 by approximately 0.54 percentage points.

Figure 2. Stress test of the NPL increase in 2025 for the GDP growth-rate series



Source: Created by the author

Figure 2 shows the difference between the projected GDP path without the shock (blue line) and the simulated growth rate in the case of a climate shock affecting the financial sector (red line). The deviation in 2025 visually confirms the simulation results and points to the serious consequences that may arise from physical climate shocks. It should be noted,

however, that the analysis is based on the 2010 scenario, whereas future climate-related disasters may be considerably more severe.

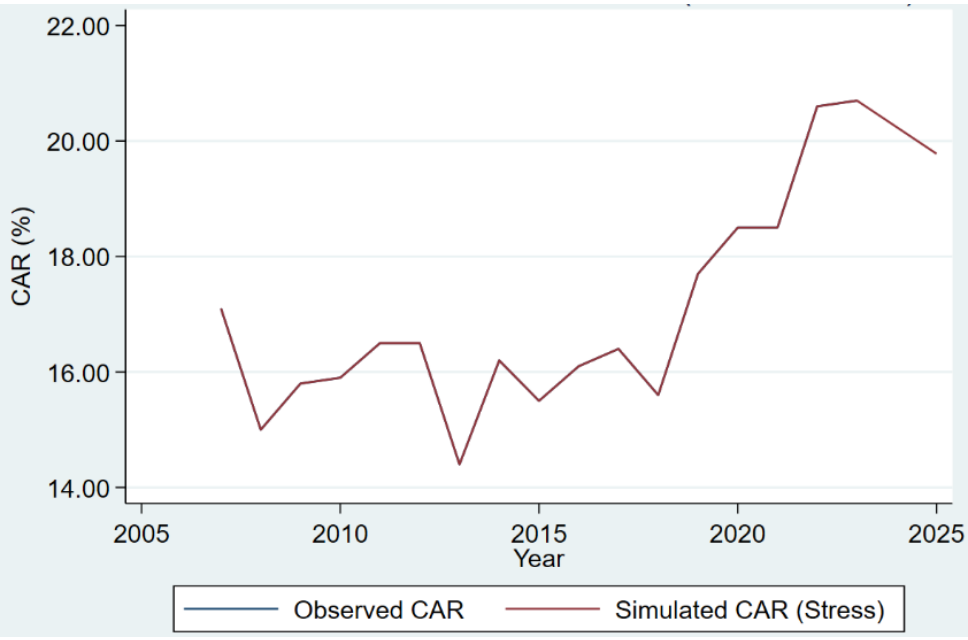
In the final step of the analysis, attention was directed to banking-system stability, specifically to how a climate shock may affect banks' capital adequacy ratio (CAR), one of the key indicators of banking-sector resilience. For this purpose, a linear regression model was used in which CAR is specified as the dependent variable, while the share of non-performing loans (NPLs), the GDP growth rate, and return on assets (ROA), which reflects bank profitability, are included as independent variables (Appendix 3). The data were collected from the World Bank website and cover the period from 2007 to 2023, except for ROA, for which the latest available data refer to 2021.

The model results indicate a statistically significant negative relationship between NPLs and CAR: an increase in the share of non-performing loans by one percentage point leads to an approximately 0.14 percentage-point decrease in capital adequacy ($p = 0.035$). Although the remaining variables in the model did not show statistical significance, they were retained for control purposes and to provide a more comprehensive view of the structure of effects.

The decline in CAR results from increased provisioning and the growth of risk-weighted assets, which is consistent with standard regulatory mechanisms.

Based on this model, a climate-shock scenario simulation was conducted in which an extreme flood in 2025 is assumed to cause a sharp increase in NPLs. Applying the estimated model, the path of CAR was simulated under these conditions, making it possible to assess the potential effects of climate risk on bank capital.

Figure 3. Stress test of the NPL increase in 2025 for capital adequacy



Source: Created by the author

Figure 3 presents the simulated CAR path under the climate-shock scenario (red line), showing a clear decline in 2025 relative to the previous trend. This visually confirms the model results and highlights the importance of integrating climate risks into financial-stability assessments, as the spillover effect of climate shocks, in this case physical shocks, on the macro-financial profile of an economy is evident.

Although these are basic models for climate-shock stress testing, the results indicate potentially significant and systemic implications of climate events for banks' capital

positions. For this reason, such simulations serve as a starting point for further development of climate stress testing and as support for policymakers in defining macroprudential measures and managing climate risks in line with the growing requirements of international regulators such as the NGFS (2020) and the BIS (2021).

The climate stress-test model implemented in this study is not limited to direct physical risk, but also models its systemic effects throughout the financial chain: from bank balance sheets, through the real economy, to sectoral capital stability. The methodology applied allows for a relatively simple, yet analytically convincing, simulation of climate risk tailored to the Montenegrin context and provides a basis for the further development of more advanced stress-testing exercises within the Central Bank or other regulatory authorities.

3.2 Diagnostic Tests

The diagnostic tests relevant to this analysis include tests of stationarity, heteroskedasticity, autocorrelation, and multicollinearity. The Augmented Dickey-Fuller (ADF) test was used to examine stationarity, and the results are presented in the table below at the 5% level of statistical significance.

Table 2. Summary of stationarity in the series used

Variable	Level (ADF)	First difference (ADF)	Conclusion
NPL	Non-stationary	Stationary	I(1)
Inflation	Non-stationary	Stationary	I(1)
Unemployment	Non-stationary	Stationary	I(1)
CAR	Non-stationary	Stationary	I(1)
GDP growth rate	Stationary	—	I(0)

Source: Created by the author

To examine the existence of a long-run relationship between the observed variables, residual-based tests were conducted. The results indicate the presence of cointegration, which justifies estimating the model in levels. None of the diagnostic tests indicated serious econometric problems, while robust standard errors were used to increase the reliability of the estimates.

3.3 Discussion of Results

In the first part of the analysis, the finding that the 2010 flood had a statistically significant effect on the growth of NPLs (6.65 percentage points) represents key evidence of banking-sector vulnerability to extreme climate events. This result is consistent with the literature showing that physical climate risks affect borrowers' repayment capacity through the loss of assets, income, or productive capacity (NGFS 2020; ECB 2021). In addition to confirming the relevance of climate events as a factor of financial stability, this result strengthens the argument for incorporating physical climate risks into credit-rating models and supervisory practices.

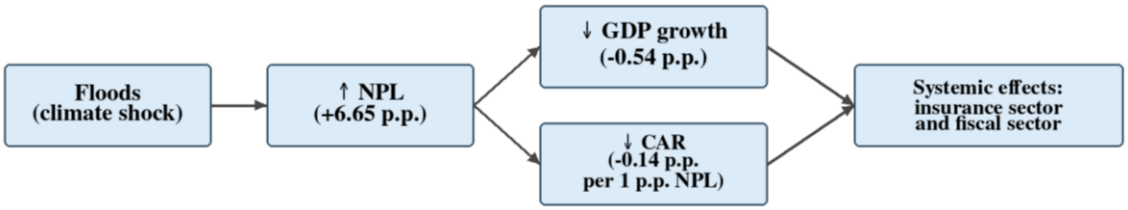
Furthermore, the finding that unemployment has a positive and statistically significant effect on NPLs, amounting to 1.57 percentage points for each one-percentage-point increase, confirms the traditional view of the macroeconomic determinants of credit risk. This is expected, since unemployment reduces household disposable income and increases the probability of delayed loan repayment. Inflation, by contrast, did not prove to be a significant predictor in this context, which may indicate a relatively limited or indirect channel through which it affects banks' asset quality in Montenegro.

Year 2026, Issue 32: 51-62
DOI: 10.7251/ZREFIS2632051P

The stress test shows that a simulated climate shock in 2025 could almost double the share of non-performing loans, from 5.8% to 12.45%. This hypothetical scenario provides a basis for quantifying the potential impact on the real economy and the financial system. The projected reduction of the GDP growth rate by 0.54 percentage points in response to such an increase in NPLs illustrates the classic mechanism through which financial instability is transmitted to the macroeconomic domain.

An interesting finding, which may initially appear counterintuitive, is the negative correlation between NPLs and capital adequacy (CAR). Although one might assume that increased risk requires higher capital, banking practice points to the opposite effect: higher NPLs lead to a reduction in capital through losses and provisioning, while simultaneously increasing risk-weighted assets, thereby reducing CAR. This mechanism is fully consistent with the existing theoretical framework and the findings of previous studies (Makri et al. 2014; Hou and Dickinson 2007; Ghosh 2015). The simulation confirms that a significant increase in NPLs in 2025 as a result of a physical climate shock could substantially impair CAR, with direct consequences for banking-system stability.

Figure 4. Transmission chain of a physical climate shock through Montenegro's financial and macroeconomic system



Source: Created by the author

Overall, the results of this study confirm that physical climate risks, such as floods, can no longer be viewed solely as environmental issues.

Despite the relevance of the results obtained, this study has certain limitations that should be taken into account when interpreting the findings. First, the analysis is based on a relatively small sample covering the period from 2007 to 2023, which may limit the statistical power of the models and affect the stability of the estimates. Although robust standard errors and additional techniques such as bootstrap estimation were used to mitigate potential small-sample problems, the results should still be interpreted with a certain degree of caution.

Second, the operationalisation of climate risk in this paper is based on the use of a dummy variable representing an extreme climate event, namely the 2010 flood. Although intuitive and applicable under conditions of limited data availability, this approach does not fully capture the complexity and continuity of climate risks. Accordingly, the results reflect the effect of one specific event rather than the entire spectrum of climate shocks.

Finally, the model is simplified and does not include all potential channels of climate-risk transmission, such as effects on the insurance market, public finances, or international financial flows. Future research could extend the analysis by incorporating more complex modelling approaches and more detailed indicators of climate exposure.

CONCLUSION

This study provides an empirically grounded analysis of the systemic effects of climate risks on the financial stability of Montenegro, with a particular focus on the banking sector. Using a modified climate stress test, the analysis shows that an extreme climate event,

in this case a flood, may have multiple effects: it may increase the share of non-performing loans (NPLs), reduce economic activity (GDP), and ultimately threaten banks' capital adequacy (CAR). These effects are not isolated; rather, they are transmitted through the financial system, affecting the banking sector, insurance, the government's fiscal position, and the real economy.

The model indicates that Montenegro's financial system is sensitive to climate shocks, particularly given the country's geographic exposure and the dominance of banks in the financial structure. At the same time, the analysis of the relationship between NPLs and CAR reveals a potentially counterintuitive finding, namely a negative association. This points to a real mechanism of pressure on capital reserves under conditions of financial stress and is consistent with the existing literature on financial stability. In this context, climate risks should be treated as an essential component of financial supervision and macroprudential policy, rather than as an external or secondary category of risk, since their consequences are evidently far-reaching and very serious.

The key recommendations arising from the analysis are as follows:

1. Institutionalise climate risks within the Central Bank

The Central Bank of Montenegro should formally integrate climate risks into its supervisory and analytical framework, including the development of climate-risk indicators and the regular application of climate stress tests adapted to the local context.

2. Establish an interinstitutional platform for climate stability

A Working Group on Climate-Related Financial Risks should be established to bring together the Central Bank, the Ministry of Finance, the Environmental Protection Agency, and other relevant bodies, with the aim of coordinating data, policies, and responses to climate shocks.

3. Improve statistics and access to climate-risk data

The lack of high-frequency and spatial data on climate events, damages, and sectoral exposure represents a serious obstacle to more precise modelling. The establishment of a national climate-exposure registry is recommended, integrating data on floods, droughts, insurance, financial losses, and risk-sensitive sectors.

REFERENCES

Adrian, Tobias, James Morsink, and Liliana Schumacher. 2020. "Assessing Climate-Change Risk by Stress Testing for Financial Resilience." *IMF Blog*, February 5, 2020. https://www.imf.org/en/blogs/articles/2020/02/05/blog-assessing-climate-change-risk-by-stress-testing-for-financial-resilience.

Brunetti, Celso, Benjamin Dennis, Dylan Gates, Diana Hancock, David Ignell, Elizabeth K. Kiser, Gurubala Kotta, Anna Kovner, Richard J. Rosen, and Nicholas K. Tabor. 2021. "Climate Change and Financial Stability." *FEDS Notes*. Washington, DC: Board of Governors of the Federal Reserve System, March 19, 2021. https://doi.org/10.17016/2380-7172.2893.

Campiglio, Emanuele, Yannis Dafermos, Pierre Monnin, Josh Ryan-Collins, Gertjan Schotten, and Masazumi Tanaka. 2018. "Climate Change Challenges for Central Banks and Financial Regulators." *Nature Climate Change* 8 (6): 462–468. https://doi.org/10.1038/s41558-018-0175-0.

Carè, Rosella. 2023. "Climate-Related Financial Risks: Exploring the Known and Charting the Future." *Current Opinion in Environmental Sustainability* 65: 101385. https://doi.org/10.1016/j.cosust.2023.101385.

Carney, Mark. 2015. "Breaking the Tragedy of the Horizon: Climate Change and Financial Stability." Speech at Lloyd's of London, London, September 29, 2015. Bank of England. https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability.

Chalabi-Jabado, Fatima, and Ydriss Ziane. 2024. "Climate Risks, Financial Performance and Lending Growth: Evidence from the Banking Industry." *Technological Forecasting and Social Change* 209: 123757. https://doi.org/10.1016/j.techfore.2024.123757.

Delis, Manthos D., Konstantinos de Greiff, Maria Iosifidi, and Steven Ongena. 2024. "Being Stranded with Fossil Fuel Reserves? Climate Policy Risk and the Pricing of Bank Loans." *Financial Markets, Institutions & Instruments* 33 (3): 239–265. https://doi.org/10.1111/fmii.12189.

Engle, Robert F., and Clive W. J. Granger. 1987. "Co-integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55 (2): 251–276. https://doi.org/10.2307/1913236.

Estrada, Francisco, Miguel A. Altamirano del Carmen, Oscar Calderon-Bustamante, W. J. Wouter Botzen, Serafin Martinez-Jaramillo, and Stefano Battiston. 2024. "Assessing the Physical Risks of Climate Change for the Financial Sector: A Case Study from Mexico's Central Bank." *arXiv* preprint arXiv:2411.18834. https://arxiv.org/abs/2411.18834.

European Central Bank. 2021. *Climate-Related Risk and Financial Stability*. Frankfurt: European Central Bank. https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf.

European Central Bank. 2022. *2022 Climate Risk Stress Test*. Frankfurt: European Central Bank. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.climate_stress_test_report.20220708~2e3cc0999f.en.pdf.

Ghosh, Atanu. 2015. "Banking-Industry Specific and Regional Economic Determinants of Non-Performing Loans: Evidence from US States." *Journal of Financial Stability* 20: 93–104. https://doi.org/10.1016/j.jfs.2015.08.004.

Imbens, Guido W., and Michal Kolesár. 2016. "Robust Standard Errors in Small Samples: Some Practical Advice." *Review of Economics and Statistics* 98 (4): 701–712. https://doi.org/10.1162/rest_a_00552.

International Monetary Fund. 2021. *IMF Strategy to Help Members Address Climate Change-Related Policy Challenges: Priorities, Modes of Delivery, and Budget Implications*. Washington, DC: International Monetary Fund. https://www.imf.org/en/Publications/Policy-Papers/Issues/2021/07/30/IMF-Strategy-to-Help-Members-Address-Climate-Change-Related-Policy-Challenges-Priorities-463093.

Jessop, Simon, and Virginia Furness. 2024. "African Bank Stress Test Flags Systemic Risks Posed by Nature Loss." *Reuters*, July 15, 2024. https://www.reuters.com/business/finance/african-bank-stress-test-flags-systemic-risks-posed-by-nature-loss-2024-07-15/.

Klein, Nir. 2013. "Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance." *IMF Working Paper* no. 13/72. https://doi.org/10.5089/9781484318522.001.

Louzis, Dimitrios P., Angelos T. Vouldis, and Vasilios L. Metaxas. 2012. "Macroeconomic and Bank-Specific Determinants of Non-Performing Loans in Greece." *Journal of Banking & Finance* 36 (4): 1012–1027. https://doi.org/10.1016/j.jbankfin.2011.10.012.

Makri, Vasiliki, Athanasios Tsagkanos, and Athanasios Bellas. 2014. "Determinants of Non-Performing Loans: The Case of the Eurozone." *Panoeconomicus* 61 (2): 193–206. https://doi.org/10.2298/PAN1402193M.

Messai, Ahlem S., and Fathi Jouini. 2013. "Micro and Macro Determinants of Non-Performing Loans." *International Journal of Economics and Financial Issues* 3 (4): 852–860. https://www.econjournals.com/index.php/ijefi/article/view/517.

Network for Greening the Financial System. 2020a. *Guide for Supervisors: Integrating Climate-Related and Environmental Risks into Prudential Supervision*. Paris: Network for Greening the Financial System. https://www.ngfs.net/en/publications-and-statistics/publications/guide-supervisors-integrating-climate-related-and-environmental-risks-prudential-supervision.

Network for Greening the Financial System. 2020b. *Guide to Climate Scenario Analysis for Central Banks and Supervisors*. Paris: Network for Greening the Financial System. https://www.ngfs.net/en/publications-and-statistics/publications/old-guide-climate-scenario-analysis-central-banks-and-supervisors-2020-version.

Network for Greening the Financial System. 2024. *Scenarios in Action: A Progress Report on Global Supervisory and Central Bank Climate Scenario Exercises*. Paris: Network for Greening the Financial System. https://www.ngfs.net/en/publications-and-statistics/publications/scenarios-action-progress-report-global-supervisory-and-central-bank-climate-scenario-exercises.

Roncoroni, Andrea, Stefano Battiston, Luis O. Escobar-Farfán, and Sergio Martinez-Jaramillo. 2021. "Climate Risk and Financial Stability in the Network of Banks and Investment Funds." *Journal of Financial Stability* 54: 100870. https://doi.org/10.1016/j.jfs.2021.100870.

World Bank. 2024. *Double Trouble? Assessing Climate Physical and Transition Risks for the Moroccan Banking Sector*. Washington, DC: World Bank. https://openknowledge.worldbank.org/entities/publication/bc559168-cb93-445c-b70a-969a98a83024.

APPENDICES

Appendix 1. NPL model including lagged values and graphical presentation of the dynamic effect

Linear regression

Number of obs	= 16
F(3, 11)	= .
Prob > F	= .
R-squared	= 0.8850
Root MSE	= 2.2329

npl	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
npl						
L1.	.5141778	.1494488	3.44	0.006	.1852432	.8431124
flood_dummy	5.347125	1.41027	3.79	0.003	2.24314	8.451109
inflation	.1560685	.1436517	1.09	0.301	-.1601067	.4722437
unemployment	1.31103	.3973966	3.30	0.007	.4363663	2.185694
_cons	-17.79787	6.474176	-2.75	0.019	-32.04744	-3.548308

Appendix 2. Econometric output of the GDP growth-rate regression

Linear regression

Number of obs	= 17
F(3, 13)	= 2.85
Prob > F	= 0.0782
R-squared	= 0.2149
Root MSE	= 6.065

gdp_growth	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
npl	.0882222	.4540614	0.19	0.849	-.8927178	1.069162
inflation	.5273859	.4042394	1.30	0.215	-.3459203	1.400692
unemployment	-.8432987	.9907584	-0.85	0.410	-2.983702	1.297105
_cons	14.769	12.51505	1.18	0.259	-12.26813	41.80613

Appendix 3. Econometric output of the CAR regression

Linear regression

Number of obs	= 15
F(3, 11)	= 4.87
Prob > F	= 0.0216
R-squared	= 0.3828
Root MSE	= 1.037

car	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
npl	-.1384001	.0577529	-2.40	0.035	-.2655134	-.0112868
gdp_growth	-.0440234	.0514511	-0.86	0.410	-.1572664	.0692196
ROA	-.1551119	.1764046	-0.88	0.398	-.5433759	.233152
_cons	18.07914	.7351291	24.59	0.000	16.46113	19.69715

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
UDC 631.95:502.131.1(496.5)
DOI: https://doi.org/10.7251/ZREFIS2632063B
Preliminary Communication

Year 2026, Issue 32: 63-73
Received: 18th May 2026
Revised: 11th June 2026
Accepted: 15th June 2026
Published: 23th June 2026

Sead Baraku 0009-0001-4625-7747 ✉ seadbaraku@unishk.edu.al
Faculty of Economics, University of Shkodra ''Luigj Gurakuqi'', Shkodër, Albania

Elidiana Bashi 0009-0001-3582-3694 ✉ elidiana.bashi@unishk.edu.al
Faculty of Economics, University of Shkodra ''Luigj Gurakuqi'', Shkodër, Albania

Blerta Dragusha 0000-0002-5463-5269 ✉ blerta.dragusha@unishk.edu.al
Faculty of Economics, University of Shkodra ''Luigj Gurakuqi'', Shkodër, Albania

AGROBIODIVERSITY AND RURAL RESILIENCE IN MOUNTAIN REGIONS: THE ROLE OF FARM CULTURE IN NORTHERN ALBANIA

АГРОБИОДИВЕРЗИТЕТ И РУРАЛНА ОТПОРНОСТ У ПЛАНИНСКИМ РЕГИОНИМА: УЛОГА ПОЉОПРИВРЕДНЕ КУЛТУРЕ У СЈЕВЕРНОЈ АЛБАНИЈИ

Summary: *The study examines the relationship between agrobiodiversity and rural resilience in mountain regions of Northern Albania within the broader Western Balkans context. Using longitudinal panel data from 82 households and 107 businesses across 11 villages during 2023–2025, the study applies econometric models to analyze ecological, cultural, and economic dimensions of rural development. The findings show that higher agrobiodiversity is associated with stronger economic performance, higher investment activity, and greater rural resilience. Farm culture and biodiversity communication partially mediate this relationship, while mountain rural heritage strengthens the resilience effects of agrobiodiversity. Tourism participation and higher resilience levels are also associated with lower migration intentions. The study contributes to the literature by integrating agrobiodiversity, cultural practices, and heritage within a single empirical framework. Overall, the findings support integrated rural development strategies linking biodiversity conservation, tourism diversification, and territorial sustainability in mountain economies.*
Keywords: *Agricultural diversification, Rural resilience, Agritourism, Cultural heritage, Sustainable development, Western Balkans.*
JEL classification: *Q01; Q18; R11; Z32; O13*

Резиме: *Ова студија анализира везу између агробиодиверзитета и руралне отпорности у планинским регионима Сјеверне Албаније, у ширем контексту Западног Балкана. Користећи лонгитудиналне панел-податке прикупљене од 82 домаћинства и 107 привредних субјеката у 11 села у периоду 2023–2025. године, студија примјењује економетријске моделе за анализу еколошких, културних и економских димензија руралног развоја. Резултати показују да је виши ниво агробиодиверзитета повезан са бољим економским перформансама, већим инвестицијама и израженијом руралном отпорношћу. Пољопривредна култура и комуникација биодиверзитета дјелимично посредују у овој вези, док планинско рурално насљеђе јача ефекте агробиодиверзитета на отпорност. Учешће у туризму и виши нивои отпорности такође су повезани са нижим намјерама за миграцију. Студија доприноси литератури интегрисањем агробиодиверзитета, културних пракси и насљеђа у јединствен емпиријски модел. У цјелини, резултати подржавају интегрисане стратегије руралног развоја повезане са очувањем биодиверзитета, диверзификацијом туризма и територијалном одрживошћу у планинским економијама.*
Кључне ријечи: *пољопривредна диверзификација; рурална отпорност; агротуризам; културно насљеђе; одрживи развој; Западни Балкан.*
JEL класификација: *Q01; Q18; R11; Z32; O13*

INTRODUCTION

Agrobiodiversity has become increasingly important for sustainable rural development, particularly in mountain regions exposed to climate change, demographic decline, and economic vulnerability. Diversified agricultural systems enhance ecosystem services, strengthen food-system resilience, and improve adaptive capacity under environmental and market pressures (Altieri 2002; Benton et al. 2023; Lin 2011; Pretty et al. 2018). European policy frameworks, including the Common Agricultural Policy and the Green Deal, increasingly emphasize biodiversity conservation and integrated rural sustainability strategies (European Commission 2023; OECD 2023).

These challenges are particularly evident in the Western Balkans, where fragmented agriculture, rural depopulation, weak infrastructure, and limited market integration continue to constrain development (Bogdanov and Zorica 2011; World Bank 2020). At the same time, the region retains substantial agrobiodiversity, traditional knowledge, and cultural heritage assets that provide opportunities for sustainable territorial development (FAO 2020). Recent research suggests that diversified farming systems contribute not only to ecological sustainability but also to economic resilience and rural adaptation (Altieri et al. 2015; Darnhofer et al. 2016; Wezel et al. 2014).

Rural resilience increasingly depends on interactions between ecological, cultural, and economic systems. Farm culture, including traditional agricultural knowledge and local production practices, contributes to biodiversity preservation and adaptive capacity (Berkes et al. 2000; Gómez-Baggethun et al. 2013). Similarly, biodiversity communication through storytelling, local products, and tourism experiences can transform ecological resources into economic value (Kastenholz et al., 2012; Tew and Barbieri 2012). Agritourism and rural heritage are therefore becoming important mechanisms for diversification and resilience in mountain economies (Flanigan et al. 2014; Lane and Kastenholz 2015; Živković et al. 2025).

Despite growing literature, important gaps remain. Existing studies often examine agrobiodiversity, tourism, cultural heritage, and resilience separately, while empirical longitudinal evidence from mountain regions in the Western Balkans remains limited. In particular, few studies integrate ecological, socio-cultural, and economic dimensions within a unified analytical framework.

This study addresses these gaps by analyzing how agrobiodiversity influences rural resilience in Northern Albania within the broader context of the Western Balkans. Using longitudinal panel data from 82 households and 107 businesses across 11 mountain villages during 2023–2025, the study develops an integrated framework linking agrobiodiversity, farm culture, biodiversity communication, and mountain rural heritage. The research contributes theoretically by conceptualizing resilience as a multidimensional territorial system shaped by ecological and socio-cultural interactions, while empirically providing one of the first longitudinal econometric assessments of agrobiodiversity-resilience relationships in the region. More specifically, the study addresses the following research questions:

RQ1: How is agrobiodiversity associated with the economic and social strength of rural households and businesses in mountain regions?

RQ2: To what extent do farm cultural practices and biodiversity communication influence the relationship between agrobiodiversity and rural resilience?

RQ3: What role does mountain rural heritage play in moderating the relationship between agrobiodiversity and rural resilience?

RQ4: How do the findings from Northern Albania compare with patterns observed in the Western Balkans?

The findings provide evidence relevant to integrated rural development policies that link biodiversity conservation, tourism diversification, and cultural heritage within sustainable mountain development strategies.

1. LITERATURE REVIEW

Recent studies on sustainable rural development increasingly emphasize the role of multifunctional agricultural systems that combine ecological sustainability, economic diversification, and social adaptation. In this context, agrobiodiversity is viewed not only as an environmental resource but also as a strategic component of rural resilience (Altieri 2002; Lin 2011).

Diversified farming systems improve ecosystem stability, reduce vulnerability to shocks, and strengthen adaptive capacity through broader production structures and income diversification (Tscharntke et al. 2012; Pretty et al. 2018; Benton et al. 2023).

These dynamics are particularly relevant in mountain regions characterized by fragmented agriculture, limited infrastructure, and economic vulnerability (Bogdanov and Zorica 2011). Rural resilience increasingly depends on interactions between ecological assets and socio-economic adaptation mechanisms rather than agricultural production alone (Folke 2006; Darnhofer et al. 2016).

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

Within this process, farm culture and traditional ecological knowledge play an important role in preserving biodiversity and sustaining local livelihoods through inherited cultivation practices and intergenerational knowledge transfer (Berkes et al. 2000; Gómez-Baggethun et al. 2013; Stone 2007).

Recent literature also highlights biodiversity communication as an important mechanism linking ecological resources with tourism-based value creation. Storytelling, local products, gastronomy, and visitor experiences enable rural households to transform biodiversity into economic opportunities (Kastenholz et al. 2012; Kastenholz et al. 2018). Agritourism, therefore, functions as both a diversification strategy and a mechanism that connects agriculture, tourism, and cultural identity (Barbieri and Mahoney 2009; Tew and Barbieri 2012). These relationships are especially important in mountain economies where tourism can partially offset agricultural limitations and demographic decline (Flanigan et al. 2014; Safarov et al. 2024; Kedla et al. 2025).

Rural heritage further strengthens these processes by increasing destination attractiveness and reinforcing territorial identity through traditional landscapes, architecture, and local customs (Lane 1994; MacDonald and Jolliffe 2003). Previous studies suggest that heritage assets can amplify the economic effects of biodiversity and tourism within integrated rural development systems (Lane and Kastenholz, 2015; Funduk et al. 2024; Živković et al. 2025).

These issues are particularly relevant in the Western Balkans, where rural regions continue to face depopulation, fragmented agriculture, and migration pressures (de Haas, 2010; King and Vullnetari 2003). Although the region retains significant agrobiodiversity and cultural heritage potential, empirical studies integrating ecological, cultural, and resilience dimensions remain limited. Existing research frequently examines these factors separately, while longitudinal evidence from the mountain regions of the Western Balkans remains scarce (Lazarevski et al., 2018; Sergeyeva et al., 2024; European Commission 2023; OECD 2024).

2. METHODOLOGY

This study employs a longitudinal panel design using primary data collected from the same rural households and businesses during 2023–2025 in the mountainous regions of Northern Albania. The panel structure enables the examination of temporal variations in rural resilience, agrobiodiversity, and tourism-related activities while controlling for unobserved heterogeneity across households.

2.1 Data Collection and Sample

Primary data were collected through structured surveys conducted across 11 mountain villages: Bogë, Çerem, Dedaj, Dragobi, Lekbibaj, Lepushë, Reç, Selcë, Theth, Valbonë, and Vermosh. The sample includes 82 households, 107 businesses, and 310 working-age individuals engaged in agricultural and tourism activities. Several households operated multiple economic activities, including agricultural and tourism-related businesses. To avoid duplication of observations and ensure consistency across survey waves, business-level information was aggregated to the household level. Consequently, all econometric models were estimated at the household level, with households serving as the panel units observed during the 2023–2025 study period. Data collection covered agricultural production, biodiversity-related activities, tourism participation, economic performance, migration intentions, and socio-demographic characteristics. A stratified sampling approach was applied. Villages were selected for their importance to agrobiodiversity and rural tourism, while households were randomly selected using fixed quotas for agricultural and tourism businesses. The sample represents approximately 8% of households in the CABRA project area and captures major mountain communities characterized by strong integration of agriculture and tourism. Although geographically concentrated, the dataset provides detailed longitudinal evidence from some of the most important agrobiodiversity regions in Northern Albania.

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

2.2 Construction of Composite Indices

To operationalize multidimensional rural development concepts, five composite indices were developed using standardized z-scores to ensure comparability across variables measured on different scales. Standardization was performed according to the formula:

$$Z_{ij} = \frac{X_{ij} - \bar{X}_j}{SD(X_j)}$$

where $X_{\_ij}$ represents the value of indicator $_j$ for observation $_i$, X_j is the sample mean, and $SD(X_j)$ is the standard deviation of indicator $_j$. Composite indices were calculated as the arithmetic mean of the standardized indicators comprising each construct. Equal weighting was applied because no strong theoretical or empirical justification existed for assigning differential weights. Higher index values indicate stronger performance in the corresponding dimension. Reliability tests confirmed acceptable internal consistency (Cronbach's $\alpha > 0.70$).

Agrobiodiversity Index (ABI): measures diversification across crops, livestock, food processing, and biodiversity-related activities.

Farm Culture Index (FCI): captures preservation and transmission of traditional agricultural knowledge and practices.

Biodiversity Communication Index (BCI): measures how biodiversity values are communicated through tourism experiences, local products, and storytelling.

Mountain Rural Heritage (MRH): reflects heritage-related assets, including accommodation, catering capacity, guiding services, and crafts.

Rural Resilience Index (RR): measures economic and adaptive capacity through income, sales, investments, and future investment intentions.

2.3 Econometric Modeling

All models are estimated at the household level with year fixed effects and household-clustered standard errors. Model diagnostics indicated no evidence of problematic multicollinearity (VIF = 1.00–1.69). Breusch–Pagan tests revealed significant heteroskedasticity (BP = 17.57–52.04, $p < 0.01$), justifying the use of household-clustered robust standard errors.

Direct Effects Model: The baseline model estimates the relationship between agrobiodiversity and rural resilience:

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 X_{it} + \gamma_t + \varepsilon_{it}$$

where X_{it} includes gender, education, business type, access to training, and additional income sources.

Mediation Analysis: The mediation framework evaluates whether farm culture and biodiversity communication mediate the relationship between agrobiodiversity and rural resilience. The mediation analysis followed the causal mediation framework proposed by Preacher and Hayes (2008). Indirect effects were estimated using bias-corrected bootstrapped confidence intervals based on 5,000 replications.

$$FCI_{it} = \alpha_0 + \alpha_1 ABI_{it} + \alpha_2 X_{it} + \gamma_t + \varepsilon_{it}$$

$$BCI_{it} = \delta_0 + \delta_1 ABI_{it} + \delta_2 X_{it} + \gamma_t + \varepsilon_{it}$$

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 FCI_{it} + \beta_3 BCI_{it} + \beta_4 X_{it} + \gamma_t + \varepsilon_{it}$$

Indirect effects were estimated using bootstrapped confidence intervals with 5,000 replications.

Moderation Analysis: The moderating role of mountain rural heritage was estimated through an interaction model:

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 MRH_{it} + \beta_3 (ABI \times MRH)_{it} + \beta_4 X_{it} + \gamma_t + \varepsilon_{it}$$

A positive interaction coefficient indicates that heritage assets strengthen the relationship between agrobiodiversity and rural resilience.

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

Migration Model: Migration intentions were estimated using Firth's penalized logistic regression due to the low incidence of emigration intentions:

$$\log\left(\frac{P(MI_{it}=1)}{1-P(MI_{it}=1)}\right)=\beta_0+\beta_1 RR_{it}+\beta_2 ABI_{it}+\beta_3 X_{it}+\gamma_t+\varepsilon_{it}$$

where MI_{it} indicates whether household members considered permanent migration abroad.

2.4 Western Balkans Comparative Framework

To contextualize the findings regionally, the analysis incorporates comparative benchmarks from Albania, Serbia, Bosnia and Herzegovina, Montenegro, and North Macedonia.

Table 1. Western Balkans Comparative Literature Framework

Country	Main Focus	Key Contribution
Albania	Agrotourism and agrobiodiversity	Agriculture–tourism integration and biodiversity preservation
Serbia	Rural tourism and heritage	Heritage contributes to tourism income and diversification
Bosnia and Herzegovina	Rural sustainability	Depopulation and weak institutional support
Montenegro	Agrotourism development	Tourism diversification strengthens rural economies
North Macedonia	Rural tourism	Tourism supports economic diversification

Source: Author's research

These countries share similar characteristics, including fragmented agriculture, rural depopulation, and increasing reliance on rural tourism.

3. RESULTS AND DISCUSSION

The empirical analysis is based on longitudinal panel data from 82 households, 107 businesses, and 310 working-age individuals surveyed between 2023 and 2025 across 11 mountain villages in Northern Albania. The rural economy remains dualistic, dominated by agriculture (62%) and tourism (37%), while tourism businesses increased by 29% during the study period.

Table 2. Descriptive Statistics of Key Variables

Variable	Mean	SD	Min	Max
Agrobiodiversity Index (ABI)	0.000	1.000	-1.571	0.634
Income (Lek)	498,974	217,732	113,019	1,171,112
Investment (Lek)	150,566	81,296	10,419	408,960
Tourism	0.437	0.497	0.000	1.000
Agriculture	0.712	0.453	0.000	1.000
Education	10.54	2.70	6.000	15.000
Household size	4.86	1.44	3.000	7.000
Migration intention	0.079	0.270	0.000	1.000

Source: Authors' calculations based on primary survey data (2023–2025).

Agrobiodiversity-related activities, including medicinal plants, honey production, and chestnut collection, remain widespread among households. Tourism-oriented households demonstrate substantially stronger economic performance than agriculture-only households. Average tourism income reached 632,000 Lek compared with 235,000 Lek in agriculture, while overall investments increased considerably during the observed period. Migration intentions remain relatively low (7%), although economic vulnerability continues to be the primary driver of migration.

3.1 Agrobiodiversity and Rural Resilience

Households with higher Agrobiodiversity Index (ABI) values report significantly stronger economic performance. High-ABI households achieve higher sales, income, and investment levels, suggesting that diversified agricultural systems improve economic resilience through broader production structures and value-added activities.

Table 3. Economic Performance by Agrobiodiversity Level

Indicator	Low ABI	High ABI	Difference	Significance
Average sales (000 Lek)	412	698	+286	$p < 0.01$
Average net income (000 Lek)	278	468	+190	$p < 0.01$
Total investments (000 Lek)	98	244	+146	$p < 0.05$
Future investment plans (%)	68%	88%	+20%	$p < 0.05$

Source: Authors' own calculations.

The direct-effects model confirms a significant positive relationship between agrobiodiversity and rural resilience:

$$RR = 0.42 + 0.38ABI + 0.15Education + 0.09Training + \varepsilon$$

The ABI coefficient ($\beta=0.38$, $p<0.001$) indicates that greater agricultural diversification is associated with stronger resilience outcomes.

3.2 Mediation Effects: Farm Culture and Biodiversity Communication

The mediation analysis demonstrates that Farm Culture (FCI) and Biodiversity Communication (BCI) partially mediate the relationship between agrobiodiversity and rural resilience. Agrobiodiversity positively influences both the transmission of cultural knowledge and biodiversity communication practices, thereby strengthening resilience outcomes.

Table 4. Mediation Analysis Results

Path	Coefficient	p-value
ABI → FCI	0.42	<0.001
ABI → BCI	0.51	<0.001
FCI → RR	0.29	<0.01
BCI → RR	0.34	<0.01
ABI → RR	0.38	<0.001
ABI → FCI → RR	0.12	<0.01
ABI → BCI → RR	0.17	<0.01

Source: Authors' own calculations.

The inclusion of FCI and BCI reduces the direct ABI effect, indicating partial mediation. The findings suggest that agrobiodiversity generates value not only through diversification itself but also through cultural practices and visitor-oriented communication about biodiversity.

4.3 Moderation Effects: Mountain Rural Heritage

Mountain Rural Heritage (MRH) significantly moderates the relationship between agrobiodiversity and resilience. The interaction term between ABI and MRH remains positive and statistically significant.

Table 5. Moderation Analysis Results

Variable	Coefficient	p-value
ABI	0.28	<0.01
MRH	0.31	<0.001
ABI × MRH	0.24	<0.001
Education	0.12	<0.05

Source: Authors' own calculations.

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

Households with stronger heritage assets, including traditional accommodations and tourism infrastructure, obtain substantially greater resilience benefits from agrobiodiversity activities.

3.4 Migration Intentions and Rural Resilience

The logistic regression results indicate that rural resilience and tourism engagement are associated with lower migration intentions.

Table 6. Logistic Regression Results for Migration Intentions

Variable	Odds Ratio	p-value
Rural Resilience (RR)	0.42	<0.01
Agrobiodiversity (ABI)	0.73	n.s.
Income (log)	0.58	<0.05
Tourism engagement	0.48	<0.05

Source: Authors' own calculations.

Higher resilience significantly reduces intentions to migrate, while tourism participation is associated with lower out-migration pressures. Although agrobiodiversity does not have a direct, significant effect on migration intentions, its indirect effect through rural resilience remains important. Overall, the findings support the argument that integrated agrobiodiversity–tourism systems contribute to stronger territorial resilience in mountain regions.

3.5 Comparative Analysis with the Western Balkans

Comparative analysis indicates that Northern Albania shares several structural characteristics with other rural economies in the Western Balkans, including fragmented agriculture, rural depopulation, and increasing dependence on tourism as a driver of diversification. However, the findings also reveal stronger agriculture–tourism integration and higher biodiversity communication compared with regional benchmarks.

Table 7. Comparative Indicators: Northern Albania vs Western Balkans Benchmarks

Indicator	Northern Albania (2023–2025)	Western Balkans Benchmark	Source
Average household size	5.4 persons	3.8–4.5 persons	World Bank (2020)
Businesses per household	1.31	0.8–1.2	Bogdanov and Rodić (2011)
Tourism business share	37%	15–25%	Živković et al. (2025)
Average agricultural income	€2,150	€1,800–€2,500	FAO (2020)
Average tourism income	€5,750	€4,500–€7,000	Živković et al. (2025)
Investment rate	46%	30–40%	—
Permanent emigration	1%	2–5%	King and Vullnetari (2003)
Considering emigration	7%	10–20%	—
Biodiversity communication	35%	15–25%	Baraku and Hasaj (2023)

Source: Authors' compilation based on World Bank (2020), FAO (2020), Bogdanov and Rodić (2011), Živković et al. (2025), and primary survey data.

The results suggest that Northern Albania exhibits relatively stronger biodiversity communication and tourism integration than many other comparable regions in the Western Balkans. Approximately 37% of tourism businesses source agricultural products locally, indicating stronger territorial linkages between agriculture and tourism activities. Migration intentions also remain below regional averages.

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

At the same time, persistent financing constraints, weak infrastructure, and limited access to credit continue to restrict broader rural investment and diversification. The comparative evidence suggests that Northern Albania shares several structural characteristics with other Western Balkan rural regions, including fragmented agriculture, demographic pressures, and increasing dependence on tourism diversification.

The stronger integration of agriculture, tourism, and biodiversity-related activities observed in the study area indicates a comparatively advanced stage of rural diversification. The findings position Northern Albania as a transitional mountain economy in which agrobiodiversity, tourism, and heritage increasingly serve as interconnected mechanisms for rural development.

3.6 Discussion

The findings provide strong empirical evidence that agrobiodiversity is positively associated with rural resilience in mountain regions. Households with higher levels of agricultural diversification report stronger economic performance, higher investment activity, and greater adaptive capacity. These results are consistent with previous studies emphasizing diversification as a key mechanism that supports resilience under environmental and economic pressures (Lin 2011; Darnhofer et al. 2016; Wezel et al. 2014).

The mediation analysis further demonstrates that farm culture and biodiversity communication function as important socio-cultural mechanisms linking agrobiodiversity with resilience outcomes.

Traditional knowledge systems, local production practices, and biodiversity storytelling appear particularly relevant for value creation and territorial differentiation, supporting earlier findings on the importance of cultural capital and experiential rural tourism (Berkes et al. 2000; Tew and Barbieri 2012).

The moderating role of mountain rural heritage highlights the importance of broader territorial systems in shaping rural development outcomes. The resilience effects of agrobiodiversity become significantly stronger in areas with developed heritage assets and tourism infrastructure. This supports previous research arguing that interactions between natural and cultural capital are central to sustainable rural development (Lane and Kastenholz 2015; Živković et al. 2025).

Migration-related findings also reinforce the economic significance of rural diversification. Higher resilience levels and tourism participation are associated with lower migration intentions, consistent with studies identifying economic vulnerability as a key driver of rural out-migration (de Haas 2010). These findings suggest that integrated agriculture–tourism systems may contribute to demographic stability in mountain economies.

Overall, the results indicate that agrobiodiversity contributes to rural resilience through interconnected ecological, cultural, and tourism-related mechanisms rather than through agricultural production alone. This perspective is particularly relevant for the Western Balkans, where fragmented agriculture, demographic decline, and uneven market integration continue to constrain rural development.

The findings therefore support integrated rural development approaches combining biodiversity conservation, tourism diversification, and cultural heritage preservation within broader territorial resilience strategies.

Although the panel design and robustness checks strengthen the analysis, the findings should be interpreted as longitudinal associations rather than definitive causal relationships. Nevertheless, the study provides important empirical evidence from Northern Albania and contributes to a broader understanding of resilience dynamics in transition economies in mountainous regions.

CONCLUSIONS

This study examined the relationship between agrobiodiversity and rural resilience in the mountain regions of Northern Albania within the broader Western Balkans context. The findings demonstrate that agrobiodiversity is positively associated with economic performance, adaptive capacity, and tourism-related diversification. Households with more diversified agricultural systems

Year 2026, Issue 32: 63-73
DOI: 10.7251/ZREFIS2632063B

report higher sales, income, and investment levels, indicating that agrobiodiversity serves as an important resource for territorial development.

The analysis further shows that the effects of agrobiodiversity extend beyond agricultural production alone. Farm culture and biodiversity communication partially mediate the relationship between agrobiodiversity and resilience, while mountain rural heritage strengthens these effects through tourism and heritage-related infrastructure. In addition, higher rural resilience and tourism participation are associated with lower migration intentions, suggesting that integrated agriculture–tourism systems may contribute to demographic stability in mountain areas.

From a theoretical perspective, the study contributes to the literature by integrating ecological, cultural, and heritage-related dimensions within a single analytical framework. The findings support a multidimensional understanding of rural resilience in which agrobiodiversity, tourism, and territorial heritage operate as interconnected development mechanisms.

From a policy perspective, the results support integrated rural development strategies aligned with the European Union Green Agenda and the objectives of the Common Agricultural Policy. Policies promoting biodiversity conservation, rural tourism, local value chains, and heritage preservation may strengthen resilience outcomes in mountain economies. Investments in rural infrastructure, biodiversity communication, food processing, and accessible financing mechanisms appear particularly important for increasing the economic value of agrobiodiversity-based activities.

Although the findings are based on longitudinal panel data, the results should be interpreted as robust associations rather than definitive causal effects. Future research could expand the geographical scope to include additional Western Balkan countries and incorporate longer longitudinal periods to better capture resilience dynamics over time.

The study suggests that agrobiodiversity is not only an ecological asset but also a strategic mechanism that supports sustainable rural transformation, economic resilience, and territorial sustainability in mountain regions.

REFERENCES

Altieri, Miguel A. 2002. *Agroecology: The Science of Sustainable Agriculture*. 2nd ed. Boca Raton: CRC Press. https://doi.org/10.1201/9780429495465.

Altieri, Miguel A., and Clara I. Nicholls. 2017. "The Adaptation and Mitigation Potential of Traditional Agriculture in a Changing Climate." *Climatic Change* 140 (1): 33–45. https://doi.org/10.1007/s10584-013-0909-y.

Altieri, Miguel A., Clara I. Nicholls, Alejandro Henao, and Marcos A. Lana. 2015. "Agroecology and the Design of Climate Change-Resilient Farming Systems." *Agronomy for Sustainable Development* 35 (3): 869–890. https://doi.org/10.1007/s13593-015-0285-2.

Barbieri, Carla, and Edward Mahoney. 2009. "Why Is Diversification an Attractive Farm Adjustment Strategy?" *Journal of Rural Studies* 25 (1): 58–66. https://doi.org/10.1016/j.jrurstud.2008.06.001.

Benton, Tim G., Carling Bieg, Helen Harwatt, Roshan Pudasaini, and Laura Wellesley. 2023. "Food System Resilience and Biodiversity." *Global Food Security* 38: 100708.

Berkes, Fikret, Johan Colding, and Carl Folke. 2000. "Rediscovery of Traditional Ecological Knowledge as Adaptive Management." *Ecological Applications* 10 (5): 1251–1262. https://doi.org/10.2307/2641280.

Bogdanov, Natalija, and Zorica Vasiljević. 2011. "Agriculture and Rural Development in Serbia." *Applied Studies in Agribusiness and Commerce* 5 (1–2): 47–55. https://doi.org/10.19041/Apstract/2011/1-2/6.

Bravo-Peña, Felipe, and Landon Yoder. 2024. "Agrobiodiversity and Smallholder Resilience: A Scoping Review." *Journal of Environmental Management* 351: 119882. https://doi.org/10.1016/j.jenvman.2023.119882.

Cheer, Joseph M. 2024. "Rural Revitalization, Rural Tourism and Countryside Capital: A Rural Society Redux." *Rural Society* 33 (3): 163–173. https://doi.org/10.1080/10371656.2025.2480937.

Czaika, Mathias, and Constantin Reinprecht. 2022. "Migration Drivers: Why Do People Migrate?" In *Introduction to Migration Studies*, edited by Peter Scholten, 49–65. IMISCOE Research Series. Cham: Springer. https://doi.org/10.1007/978-3-030-92377-8_3.

Darnhofer, Ika, Claire Lamine, Agnes Strauss, and Mireille Navarrete. 2016. "The Resilience of Family Farms: Towards a Relational Approach." *Journal of Rural Studies* 44: 111–122. https://doi.org/10.1016/j.jrurstud.2016.01.013.

de Haas, Hein. 2010. "Migration and Development: A Theoretical Perspective." *International Migration Review* 44 (1): 227–264. https://doi.org/10.1111/j.1747-7379.2009.00804.x.

European Commission. 2021. *The Green Agenda for the Western Balkans*. Brussels: European Commission.

European Commission. 2023. *The Common Agricultural Policy: 2023–2027*. Brussels: European Commission. https://doi.org/10.2762/25320.

European Commission. 2024. *Report on the Implementation of the Green Agenda for the Western Balkans*. Brussels: European Commission.

FAO. 2019. *The State of the World's Biodiversity for Food and Agriculture*. Rome: Food and Agriculture Organization of the United Nations.

FAO. 2020. *Agrobiodiversity in the Western Balkans*. Rome: Food and Agriculture Organization of the United Nations.

FAO. 2024. *Green Agenda for the Western Balkans: Progress Report on Sustainable Agriculture*. Rome: Food and Agriculture Organization of the United Nations.

Fekadu, Hailu. 2025. "The Role of Agrobiodiversity and Diverse Causes of Its Losses and Methods of Conservation: A Review." *Food and Humanity* 4: 100500. https://doi.org/10.1016/j.foohum.2025.100500.

Flanigan, Sharon, Kirsty Blackstock, and Colin Hunter. 2014. "Agritourism Perspectives." *Tourism Management* 40: 394–405. https://doi.org/10.1016/j.tourman.2013.07.004.

Folke, Carl. 2006. "Resilience: The Emergence of a Perspective for Social–Ecological Systems Analyses." *Global Environmental Change* 16 (3): 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002.

Funduk, Marina, Ivana Biondić, and Abra Lea Simonić. 2024. "Revitalizing Rural Tourism: A Croatian Case Study in Sustainable Practices." *Sustainability* 16 (1): 31. https://doi.org/10.3390/su16010031.

Gómez-Baggethun, Erik, Esteve Corbera, and Victoria Reyes-García. 2013. "Traditional Ecological Knowledge." *Ecology and Society* 18 (4): 72. https://www.jstor.org/stable/26269385.

Jackson, Louise E., Unai Pascual, and Toby Hodgkin. 2007. "Utilizing and Conserving Agrobiodiversity in Agricultural Landscapes." *Agriculture, Ecosystems and Environment* 121 (3): 196–210. https://doi.org/10.1016/j.agee.2006.12.017.

Kastenholz, Elisabeth, Maria João Carneiro, Carlos Peixeira Marques, and Joana Lima. 2012. "Understanding and Managing the Rural Tourism Experience: The Case of a Historical Village in Portugal." *Tourism Management Perspectives* 4: 207–214. https://doi.org/10.1016/j.tmp.2012.08.009.

Kastenholz, Elisabeth, Maria João Carneiro, Carlos Peixeira Marques, and Sandra M. C. Loureiro. 2018. "The Dimensions of Rural Tourism Experience: Impacts on Arousal, Memory, and Satisfaction." *Journal of Travel and Tourism Marketing* 35 (2): 189–201. https://doi.org/10.1080/10548408.2017.1350617.

King, Russell, and Julie Vullnetari. 2003. "Migration and Development in Albania." *Journal of Balkan and Near Eastern Studies* 20 (4): 367–384.

Lane, Bernard. 1994. "Rural Tourism Definition." *Journal of Sustainable Tourism* 2: 7–21. https://doi.org/10.1080/09669589409510680.

Lane, Bernard, and Elisabeth Kastenholz. 2015. "Rural Tourism: The Evolution of Practice and Research Approaches – Towards a New Generation Concept?" *Journal of Sustainable Tourism* 23: 1133–1156. https://doi.org/10.1080/09669582.2015.1083997.

Lazarevski, Goce, Cane Koteski, and Zlatko Jakovlev. 2018. "Possibilities for the Development of Rural Tourism in the Republic of Macedonia." *Journal of Process Management New Technologies* 5 (2): 18–24. https://doi.org/10.5937/jouproman5-13488.

Lin, Brenda B. 2011. "Resilience in Agriculture through Crop Diversification: Adaptive Management for Environmental Change." *BioScience* 61: 183–193. https://doi.org/10.1525/bio.2011.61.3.4.

MacDonald, Roberta, and Lee Jolliffe. 2003. "Cultural Rural Tourism." *Annals of Tourism Research* 30 (2): 307–322. https://doi.org/10.1016/S0160-7383(02)00061-0.

Nyanghura, Qambemeda M., Lisa Biber-Freudenberger, and Jan Börner. 2024. "Incentives for Biodiversity Conservation." *Ecological Economics* 219: 108152. https://doi.org/10.1016/j.ecolecon.2024.108152.

OECD. 2020. *Rural Well-Being*. Paris: OECD Publishing.

OECD. 2023. *Rural Resilience in a Changing World*. Paris: OECD Publishing.

OECD. 2024. *Sustainable Rural Development in Southeast Europe*. Paris: OECD Publishing.

Pretty, Jules, Tim G. Benton, Zareen Pervez Bharucha, Lynn V. Dicks, Cornelia B. Flora, H. Charles J. Godfray, David Goulson, Sue Hartley, Nic Lampkin, Carol Morris, Gary M. Pierzynski, P. V. Vara Prasad, John Reganold, Johan Rockström, Pete Smith, Peter Thorne, and Stephen D. Wratten. 2018. "Global Assessment of Agricultural System Redesign for Sustainable Intensification." *Nature Sustainability* 1: 441–446. https://doi.org/10.1038/s41893-018-0114-0.

Safarov, Bahodirhon, Akmal Amirov, Nargiza Mansurova, Thowayeb H. Hassan, Habibullo Hasanov, and Ana Cornelia Pereș. 2024. "Prospects of Agrotourism Development in the Region." *Economies* 12 (12): 321. https://doi.org/10.3390/economies12120321.

Tew, Christine, and Carla Barbieri. 2012. "The Perceived Benefits of Agritourism: The Provider's Perspective." *Tourism Management* 33 (1): 215–224. https://doi.org/10.1016/j.tourman.2011.02.005.

Tscharntke, Teja, Yann Clough, Thomas C. Wanger, Louise Jackson, Iris Motzke, Ivette Perfecto, John Vandermeer, and Anthony Whitbread. 2012. "Global Food Security, Biodiversity Conservation and the Future of Agricultural Intensification." *Biological Conservation* 151 (1): 53–59. https://doi.org/10.1016/j.biocon.2012.01.068.

UNDP. 2021. *Rural Economy of Bosnia and Herzegovina*. Sarajevo: United Nations Development Programme.

UNEP. 2022. *Heritage and Sustainable Development*. Nairobi: United Nations Environment Programme.

UNESCO. 2019. *World Heritage and Sustainable Development*. Paris: UNESCO.

Wezel, Alexander, Marion Casagrande, Florence Celette, Jean-François Vian, Aurélie Ferrer, and Joséphine Peigné. 2014. "Agroecological Practices." *Agronomy for Sustainable Development* 34 (1): 1–20. https://doi.org/10.1007/s13593-013-0180-7.

World Bank. 2020. *Rural Development in the Western Balkans*. Washington, DC: World Bank.

World Bank. 2023. *Western Balkans: Rural Development and Resilience*. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-1990-0.

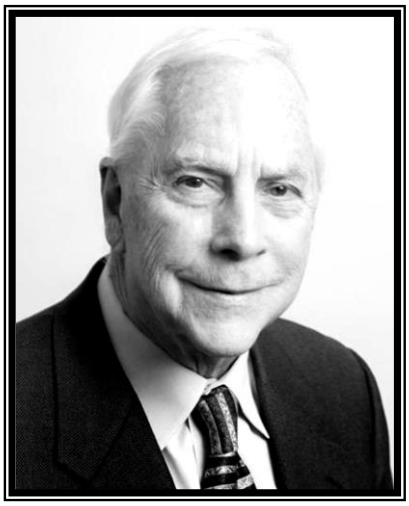
Živković, Milka B., Bojan Đerčan, Predrag Mlinarević, Marija Cimbaljević, Zorica Pogrmić, Tamara Lukić, Bojana Kalenjuk Pivarski, Goran Balotić, Dejan Pljuco, Milan Lalić, and Nikola Lopatić. 2025. "Rural Tourism as a Factor of Rural Revitalization and Sustainability in the Republic of Serbia and Bosnia and Herzegovina." *Sustainability* 17 (11): 5127. https://doi.org/10.3390/su17115127.

IN MEMORIAM

Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Proceedings of the Faculty of Economics in East Sarajevo
In Memoriam

Year 2026, Issue 32: 77-80

Nemanja Šarenac 0000-0003-0656-6577 ✉ nemanja.sarenac@ekofis.ues.rs.ba
Faculty of Economics Pale, University of East Sarajevo, Bosnia and Herzegovina



IN MEMORIAM

DONALD E. HAWKINS, Professor Emeritus
November 9, 1936 – December 31, 2025

Проф. др ДОНАЛД Е. ХОКИНС, емеритус
9. новембар 1936. год. – 31. децембар 2025. год.

The academic and professional community in the field of tourism has lost one of its most distinguished figures. Professor Donald E. Hawkins, Professor Emeritus at The George Washington University, internationally recognized scholar, practitioner and advisor in the field of tourism policy, sustainable tourism and tourism education, passed away on December 31, 2025.

Professor Hawkins belonged to the generation of scholars who did not understand tourism merely as an economic activity, but as a complex social, cultural, developmental and educational phenomenon. His academic and professional work contributed significantly to the recognition of tourism as a serious field of scientific inquiry, public policy and institutional development. Over more than five decades, he shaped the way tourism was studied, taught and managed, leaving a deep mark on universities, international organizations, governments, development institutions, destinations and generations of students across the world.

As a long-standing professor at The George Washington University, Professor Hawkins played a pioneering role in the development of tourism education in the United States and globally. He was closely associated with the establishment and development of academic programmes and research institutions that connected tourism studies with international development, sustainability, destination management and public policy. His work was grounded in the belief that tourism education must not be reduced to the transfer of technical knowledge, but should develop professionals capable of understanding destinations, communities, institutions and the long-term consequences of tourism development.

His contribution extended far beyond the university setting. Professor Hawkins was a globally respected consultant and advisor, working with governments, international organizations, development banks and destination authorities in different parts of the world. Through his engagement with Solimar International and numerous international initiatives, he consistently advocated tourism that creates value for local communities, protects natural and cultural heritage, strengthens institutional capacities and contributes to sustainable development. Long before sustainability became a dominant concept in tourism discourse,

Professor Hawkins understood that the future of tourism depends on the quality of governance, education, knowledge and responsibility.

The international significance of his work was confirmed by numerous recognitions, among which the first UNWTO Ulysses Prize, awarded in 2003, holds a special place. This recognition symbolically confirms what his colleagues, students and partners had long known: that Professor Hawkins was one of the leading global voices in the creation and dissemination of knowledge in tourism policy and strategic management. His advisory roles within the UN tourism system further reflected the trust placed in his expertise, judgment and vision.

For the Faculty of Economics Pale, University of East Sarajevo, Professor Hawkins will also remain remembered as a distinguished colleague and friend who supported an important institutional step in the development of tourism education. Within the UNWTO TedQual certification process, he visited the Faculty in October 2021 and took part in meetings with the Faculty management, university representatives, teachers, administration, students, representatives of relevant ministries, tourism organizations and the tourism industry. On that occasion, he also delivered a lecture to students on contemporary tourism trends and the education of highly qualified tourism professionals.

His visit was not merely a formal event. It represented one of those moments in which a local academic institution becomes directly connected with the highest international standards of tourism education. Through his professional authority, experience and constructive support, Professor Hawkins contributed to the process that later resulted in the Faculty of Economics Pale becoming the first higher education institution in Bosnia and Herzegovina to receive the UNWTO TedQual certificate for the study programme Tourism and Hospitality. That achievement remains one of the most important international recognitions in the institutional development of the Faculty and its tourism study programme.

For our academic community, Professor Hawkins' contribution is therefore remembered on two levels. On the global level, he was one of the founders and builders of modern tourism education, sustainable tourism policy and destination development. On the institutional level, he was a respected international expert whose support and presence strengthened the confidence of the Faculty of Economics Pale in its efforts to align tourism education with international quality standards.

The legacy of Professor Hawkins is not contained only in his publications, projects, awards or institutional roles. It is also reflected in the people he mentored, the destinations he helped, the academic programmes he inspired and the professional standards he helped establish. His life's work reminds us that tourism, when guided by knowledge, ethics and responsibility, can be more than movement, consumption or statistics. It can be a space of learning, cooperation, cultural understanding and sustainable development.

The Faculty of Economics Pale and the Editorial Board of the Proceedings of the Faculty of Economics in East Sarajevo express their deep respect for the life and work of Professor Donald E. Hawkins. His name will remain connected with one of the most important international quality processes in the history of our Faculty, while his broader academic and professional legacy will continue to inspire scholars, teachers, students and practitioners in tourism throughout the world.

Dear professor, rest in peace. Your contribution to the world will remain invaluable.

* * *

Академска и стручна заједница у области туризма изгубила је једну од својих најзначајнијих личности. Проф. др Доналд Е. Хокинс, професор емеритус Универзитета „Џорџ Вашингтон“, међународно признати научник, практичар и савјетник у области туристичке политике, одрживог туризма и образовања у туризму, преминуо је 31. децембра 2025. године.

Професор Хокинс припадао је оној генерацији научника који туризам нису посматрали само као привредну дјелатност, већ као сложен друштвени, културни, развојни и образовни феномен. Његов академски и професионални рад значајно је допринио томе да туризам буде препознат као озбиљно поље научног истраживања, јавних политика и институционалног развоја. Током више од пет деценија обликовао је начин на који се туризам изучава, предаје и управља, остављајући дубок траг на универзитетима, међународним организацијама, владама, развојним институцијама, дестинацијама и генерацијама студената широм свијета.

Као дугогодишњи професор Универзитета „Џорџ Вашингтон“, професор Хокинс имао је пионирску улогу у развоју образовања у туризму у Сједињеним Америчким Државама и на глобалном нивоу. Био је снажно везан за успостављање и развој академских програма и истраживачких институција које су повезивале студије туризма са међународним развојем, одрживошћу, управљањем дестинацијама и јавним политикама. Његов рад почивао је на увјерењу да се образовање у туризму не смије свести на пренос техничких знања, већ да мора развијати стручњаке способне да разумију дестинације, заједнице, институције и дугорочне посљедице туристичког развоја.

Његов допринос далеко је превазилазио универзитетски оквир. Професор Хокинс био је глобално уважен консултант и савјетник, који је сарађивао са владама, међународним организацијама, развојним банкама и дестинацијским управама у различитим дијеловима свијета. Кроз ангажман у међународним иницијативама и организацијама, досљедно се залагао за туризам који ствара вриједност за локалне заједнице, штити природно и културно насљеђе, јача институционалне капацитете и доприноси одрживом развоју. Много прије него што је одрживост постала доминантан појам у туристичком дискурсу, професор Хокинс је разумио да будућност туризма зависи од квалитета управљања, образовања, знања и одговорности.

Међународни значај његовог рада потврђен је бројним признањима, међу којима посебно мјесто заузима прва UNWTO Ulysses Prize, додијељена 2003. године. Ово признање симболично потврђује оно што су његове колеге, студенти и партнери одавно знали: да је професор Хокинс био један од водећих свјетских гласова у стварању и ширењу знања из области туристичке политике и стратешког управљања. Његове савјетодавне улоге у оквиру система Свјетске туристичке организације додатно су свједочиле о повјерењу које је међународна заједница имала у његову стручност, расуђивање и визију.

За Економски факултет Пале Универзитета у Источном Сарајеву професор Хокинс остаће упамћен и као уважени колега и пријатељ који је подржао један од најважнијих институционалних искорака у развоју образовања у области туризма. У оквиру процеса UNWTO TedQual сертификације, посјетио је Факултет у октобру 2021. године и учествовао у састанцима са руководством Факултета, представницима Универзитета, наставницима, административним особљем, студентима, представницима надлежних министарстава, туристичких организација и туристичке привреде. Том приликом одржао је и предавање студентима о савременим трендовима у туризму и образовању висококвалификованих кадрова у овој области.

Његова посјета није била само формални дио процеса евалуације. Она је представљала један од оних тренутака у којима локална академска институција непосредно ступа у контакт са највишим међународним стандардима туристичког образовања. Својим професионалним ауторитетом, искуством и конструктивном подршком професор Хокинс допринио је процесу који је касније резултирао тиме да Економски факултет Пале постане прва високошколска институција у Босни и Херцеговини која је добила UNWTO TedQual сертификат за студијски програм Туризам и хотелијерство. Тај резултат остаје једно од најзначајнијих међународних признања у институционалном развоју Факултета и његовог студијског програма из области туризма.

За нашу академску заједницу допринос професора Хокинса зато се памти на два нивоа. На глобалном нивоу, он је био један од градитеља савременог туристичког образовања, одрживе туристичке политике и развоја дестинација. На институционалном нивоу, био је уважени међународни експерт чија су подршка и присуство оснажили увјерење Економског факултета Пале да образовање у туризму може и треба бити усклађено са међународним стандардима квалитета.

Насљеђе професора Хокинса није садржано само у његовим публикацијама, пројектима, наградама и институционалним улогама. Оно се огледа и у људима које је подучавао и усмјеравао, у дестинацијама којима је помагао, у академским програмима које је инспирисао и у професионалним стандардима које је помагао да се успоставе. Његов животни рад подсјећа нас да туризам, када је вођен знањем, етиком и одговорношћу, може бити више од кретања, потрошње и статистике. Он може бити простор учења, сарадње, културног разумијевања и одрживог развоја.

Економски факултет Пале и Уредништво Зборника радова Економског факултета у Источном Сарајеву изражавају дубоко поштовање према животу и дјелу професора Доналда Е. Хокинса. Његово име остаће повезано са једним од најважнијих међународних процеса провјере квалитета у историји нашег Факултета, док ће његово шире академско и професионално насљеђе наставити да инспирише научнике, наставнике, студенте и практичаре у области туризма широм свијета.

Поштовани професоре, почивајте у миру. Ваш допринос свијету остат ће непроцењљив.

BRIEFLY ABOUT THE JOURNAL

The Proceedings of the Faculty of Economics in East Sarajevo - Journal of Economics and Business (*Зборник радова Економског факултета у Источном Сарајеву*) is a scientific publication of the Faculty. It has been published once a year since 1994 in continuity.

The journal was, according to the Ministry of Science and Technology Republic of Srpska, won 32 out of a possible 40 points, and thus classified in the first category of scientific journals.

The Proceedings of the Faculty of Economics in East Sarajevo is announced the best scientific and professional journal in Republic of Srpska for 2012.

The Proceedings publishes the papers of the scholars from the Faculty of Economics in East Sarajevo and outside the Faculty as well. The papers refer to the broad area of economic science, and their main prerequisites are scientific contributions to economic theory and practice. The papers can be of theoretical and methodological-analytical nature, and may include areas ranging from national economic policies to business policy. Most manuscripts are written in Serbian language. However, manuscripts written in other languages (English, German, French, Croatian, Russian and other Slavic languages) are accepted as well.

The concept, goals and strategy of the Proceedings are guided by the Editorial Board of the Proceedings.

The Journal is indexed in ERIH Plus, Bergen, Norway; Sherpa Romeo – JISC, United Kingdom; DOAJ - Directory of Open Access Journals, Hovedstaden, Denmark; ProQuest, Ann Arbor, Michigan, U.S.; Google Scholar; EBSCO Publishing, Ipswich; INDEX COPERNICUS International, Warsaw, Poland; CABELL′S Directories (Cabell′s Directories of Publishing Opportunities), Texas, USA; C.E.E.O.L (Central and Eastern European Online Library), Frankfurt am Main, Germany; BASE (BASE – Bielefeld Academic Search Engine), Bielefeld University Library, Germany; JEL (Journal of Economic Literature) / EconLite, (American Economic Association's Electronic Database), Pitsburg, USA; DOI Srpska, Banja Luka; CrossRef, Oxford, United Kingdom.

Authors are especially expected to contribute to scientific work and research in the following areas:

- Monitoring of the latest developments in the field of economics and their applicability in solving the development problems of the Bosnia-Herzegovina economy;
- Exploring the role of higher economic education in economic development and positioning of the Faculty within the state, market and civil society in terms of integration processes;
- The position of small countries in terms of integration processes in Europe and the globalization processes in the world;
- Analysis of growth factors and structural changes in the economy of BiH-RS;
- Ensuring continued balanced growth of the economy of Bosnia and Herzegovina;
- Removing barriers to economic development, raising the quality of life of citizens and environmental protection;
- Comparative analysis of the development of neighboring countries and analysis of the comparative competitiveness of the economy;
- Compliance of financial and real sectors of the economy;
- Research and forecasting market conditions;
- Methods to improve entrepreneurship, business efficiency and competitiveness of enterprises;

- The efficiency of the market and the state and the construction of a representative institutional infrastructure.

Editorial Board reserves the right to return to the author the texts that do not comply with the criteria of the guidelines, or to adapt the papers completely in line with the Proceedings rules and prescribed standards of Serbian language, or foreign languages. There are no further requirements for the authors concerning other technical elements of text editing. The final decision on publication of papers and their priority order is made by the Proceedings Editorial Board.

The Journal is open for cooperation with scientists from BiH and abroad all year round. All contributions to economic theory and practice are always welcome.

E-mail address for submission of entries is: *zrefis@ekofis.ues.rs.ba*

If you want to buy a **paper version** of the journal, you can pay the money to the publisher's account according to the following instructions:

For individuals: **10 BAM (5 EUR)**
For legal entities or corporations: **15 BAM (7.50 EUR)**

Payments to:

1. International Payments Instruction please contact us: zrefis@ekofis.ues.rs.ba
2. From Bosnia and Herzegovina:

Institition: **Faculty of Economics Pale**
Purpose of Remittance: **Journal ZREFIS**
Account **562-099-809-505-9834**
Type of Income: **722547**
Area: **089**
Budget Organization: **1251004**
Reference Number: **0000000404**

YOU ARE WELCOME TO CONTACT US

INSTRUCTIONS FOR AUTHORS

The Proceedings of the Faculty of Economics in East Sarajevo (*Зборник радова Економског факултета у Источном Сарајеву)* is an economic journal with a general orientation and it is published yearly. We publish original scientific papers, scientific reviews, preliminary reports, conference papers, professional papers and book reviews. Only original papers not previously published or simultaneously submitted for publishing elsewhere, should be submitted. Submitted papers need to be prepared according to the The Proceedings of the Faculty of Economics in East Sarajevo Instructions for Authors.

Papers should be submitted electronically, as an open document (Word and PDF format), ***zrefis@ekofis.ues.rs.ba***, in due time. Submissions that do not reach the scheduled date or do not meet the recommendations in the Instructions will not be submitted for review and will not be published in the Proceedings.

Authors should strictly adhere to the submission instructions for authors. Papers that do not adhere to the instructions will not enter the reviewing process.

A paper must be written in text processor *Microsoft Word*, using font *Times New Roman* (size 12), in the Cyrillic alphabet, spacing (1). **Page setup:** A4, Margins: top 2 cm; bottom 2 cm; left 2,5 cm; right 2,5 cm. Paper needs to have the length of up to 30,000 characters (16 pages). The exception from this are reviews which may be up to 50,000 characters long. A paper needs to be proof read.

Paper title. In the upper left corner there should be the family name, title and author's name (Times New Roman, 12). Example: Last name PhD (MA.) name or last name and name, BSc in Economics. The footnote on the first page shows scientific title of the author, name and address of the institution the author is employed with as well as the e-mail address of the author. The precise title of the paper (TNR, 14, bold) is three spaces below, in the middle of the page, written in capital letters.

Summary. Summary, with the length of 50-150 words, should be at the beginning of the paper, under the title, two spaces below (TNR, 11, italic). Key words are at the end of the summary, a single line below (up to five key words). At least one classification code of the Classification System for the Journal Articles, as used by the Journal of Economic Literature (JEL: http://www.aeaweb.org/journal/jel_class_system.php), should be included, also a single line below.

Headings and subheadings.
a) INTRODUCTION (TNR, 12, bold), text TNR 12, two spaces after keywords.
b) The main headings in the paper should be TNR 12, in capital letters, bold, aligned to the left margin. Among the titles in the paper there should be a single blank line. Main headlines are marked by ordinal number 1.; 2., etc..
c) Subtitles, the second level, TNR 12, bold, aligned to the left margin.
d) Subtitles, third level, TNR 12, aligned to the left margin.
e) CONCLUSION (TNR, 12, bold), text TNR 12.

Language of the paper. Papers shall be submitted in English and Serbian (Croatian, Bosnian) language.

Summary in English. In the top left corner is the name and surname of the author (TNR, 12). Three spaces below is the TITLE OF THE PAPER in English (TNR, 14, bold). Then, two spaces below follows the Summary (TNR 12, bold), followed by text (TNR 11, italic). After the text, a single line below are Key words (TNR 12, bold): Key word 1, key word 2, ... key word 5 (TNR 11, italic) and a single space below JEL classification (TNR 12, bold): E04, B12 (TNR 11, italic).

The Proceedings of the Faculty of Economics in East Sarajevo uses THE CHICAGO MANUAL OF STYLE (*AUTHOR – DATE SYSTEM*).

Reference to individuals, articles and book in the text – Basic structure of an in-text citation. Citation in the text usually appears in parentheses and includes only the first two elements in a reference list—the author and the year of publication (hence the name of the system), with no intervening punctuation. In addition, a

page number or other locator may be added, following a comma. Terms such as editor or translator, abbreviated in a reference list, are not included in a text citation.

Quotations. Any quotation, regardless of its length, needs to be followed by reference including page number. For any quotation longer than 350 characters, an author must have written approval by copy rights owner that needs to be enclosed.

Tables, charts, and pictures. Tables and graphs need to be made in *Word* or some other Word compatible format. Tables and graphs from statistical programs should be transferred into Word format. Same data may not be presented both in tables and charts. Every table, chart, or picture should be marked with number and adequate name, e.g.: Table 2: The Reliability of the Variables. The name of the table, graphic or image is placed above, TNR 11, normal, two lines between the table and the text. Pictures need to be sent in electronic form with the resolution of at least 300 dpi. If illustration from printing source is used, written authorization by copy rights owner is necessary. Source should be placed below tables, charts, and pictures. Quotations in the given Source are used in the same way as in the text. If the tables, charts, and figures are author'(s') calculations, reviews or estimations, that should also be emphasized.

Statistics. The results of statistical tests need to be provided in the following form: F (1.9) =25.35; p<001 or similar. Lower numbers of conventional P levels should also be stated (e.g.: .05, .01, .001).

References. The Proceedings of the Faculty of Economics in East Sarajevo uses **The Chicago Manual of Style** for references. Reference section must be single-spaced, beginning on a new page following the text, giving full information. Use full names of authors or editors using initials only if that is the usage of the particular author/editor. List all author/editors up to/ including 10 names. Authors of articles and books and material without specific authors or editors, such as government documents, bulletins, or newspapers, are to be listed alphabetically. Most references in the Reference section should be referenced (included) in the text.

Appendix. In the appendix, only those descriptions of material that would be useful for readers to understand, evaluate, or revise research should be provided.

Footnotes and abbreviations. Footnotes should be avoided. If necessary, references in the footnotes should be used in the same way as in the text. Abbreviations should also be avoided, except from exceptionally usual ones. The abbreviations stated in tables and pictures should be explained.

Reviews and publishing. All papers are anonymously reviewed by two anonymous reviewers. On the basis of reviews, the editorial staff makes decision on paper publishing and informs the author.

The Chicago Manual of Style - Author-Date References 17th Edition

The University of Chicago Press

Overview

15.1 The scope of this chapter. This chapter describes the second of Chicago's two systems of source citation, which uses parenthetical author-date references and a corresponding reference list. Because this system is similar in many respects to the notes and bibliography system discussed in chapter 14, much of the information from that chapter is not repeated here. For an introduction to source citations in general, including a discussion of systems other than the two recommended by Chicago, readers are encouraged to consult the overview in chapter 14 (14.1-18).

15.2 Author-date references versus notes and bibliography. Most of the recommendations in chapter 14 for how to style names of authors, titles of works, and other components in notes and bibliographies are identical for the author-date system described in this chapter. The author-date system differs primarily in its use of parenthetical text citations rather than citations in numbered notes and, in the bibliography (called a reference list in author-date style), the placement for the year of publication. For the use of notes with the author-date system, see 15.31.

15.3 Notes and bibliography entries as models for author-date references.
Most of the examples in chapter 14 are readily adapted to the author-date citation style—in almost all cases by a different ordering or arrangement of elements. Most reference list entries are identical to entries in a bibliography except for the position of the year of publication, which in a reference list follows the author's name. Unlike bibliography entries (see 14.64), each entry in the reference list must correspond to a work cited in the text. Text citations differ from citations in notes by presenting only the author's last name and the year of publication, followed by a page number or other locator, if any. This chapter, by focusing on these and other differences, will show how to adapt any of the examples in chapter 14 to the author-date system.

15.4 Sources consulted online. For a detailed discussion of URLs and DOIs, access dates and revision dates, and other considerations for citing sources consulted online, see 14.6-18. Most types of sources consulted online can be cited by adding a URL

(or, in some cases, the name of the bibliographic database) after the full facts of publication. For examples in the author-date style see 15.9, under "Journal Article," and throughout 15.46-49 and 15.50-52. For more examples, see 14.161,14.162, and throughout the discussions on periodicals (14.164-204) and elsewhere in chapter 14. For examples of access dates in author-date format, see 15.50.

Basic Format, with Examples and Variations

15.5 The author-date system—overview. The author-date system is used by many in the physical, natural, and social sciences and is recommended by Chicago for works in those areas. Sources are cited in the text, usually in parentheses, by the author's last (family) name, the publication date of the work cited, and a page number if needed. Full details appear in the reference list—usually titled "References" or "Works Cited"—in which the year of publication appears immediately after the author's name (see fig. 15.1). This arrangement makes it easy to follow a text citation to the corresponding full source in the reference list. (In electronic formats, text citations may be linked to their corresponding reference list entries.)

Text citations:
Like many other cultural fields, the video game industry is one that rewards novelty, especially when it is packaged in terms that are recognizable to consumers and critics (Lampel, Lant, and Shamsie 2000; Hutter 2011)**...** But the forefront of the industry finds continuous experimentation with the singular challenge of video gaming: how to create a convincing form of narrative storytelling that is nonetheless animated, perhaps uniquely so, by the actions of the users (Bissell 2011).

Reference list entries:

Bissell, Tom. 2011. *Extra Lives: Why Video Games Matter*. New York: Vintage Books.

Hutter, Michael. 2011. "Infinite Surprises: Value in the Creative Industries." In *The Worth of Goods: Valuation and Pricing in the Economy*, edited by Jens Beck-ert and Patrick Aspers, 201-20. New York: Oxford University Press.

Lampel, Joseph, Theresa Lant, and Jamal Shamsie. 2000. "Balancing Act: Learning from Organizing Practices in Cultural Industries." *Organization Science* 11 (3): 263-69.

For more examples of text citations and reference list entries, see 15.9. For a detailed discussion of reference lists, see 15.10-16 and 15.17-20. For text citations, see 15.21-31.

Figure 15.1. Part of a reference list for a journal article in the social sciences. See 15.5,15.6,15.10-16.

15.6 Basic structure of a reference list entry. In a reference list entry, the year of publication is the second element, following the author's name. Otherwise, a reference list entry is structured like an entry in a bibliography (see 14.21): the elements are separated by periods, and the first-listed author's name, according to which the entry is alphabetized in the reference list, is usually inverted (last name first). Titles are capitalized headline-style unless they are in a language other than English (see 8.159, 11.6); titles of larger works such as books and journals are italicized; and titles of smaller works such as journal articles are presented in roman and enclosed in quotation marks (see 8.163,14.86). Noun forms such as *editor*, *translator*, *volume*, and *edition* are abbreviated, but verb forms such as *edited by* and *translated by* are spelled out.

15.7 Basic structure of an in-text citation. In the author-date system, a citation in the text usually appears in parentheses and includes only the first two elements in a reference list—the author and the year of publication (hence the name of the system), with no intervening punctuation. A page number or other locator may be added, following a comma. Terms such as *editor* or *translator*, abbreviated in a reference list, are omitted from a text citation. In a parenthetical reference to two or more works, a semicolon usually separates each work from the next (but see 15.30).

15.8 Page numbers and other locators. In text citations, where reference is usually to a particular passage in a book or journal, only the page numbers pertaining to that passage are given. In reference lists, no page numbers are given for books; for easier location of journal articles or chapters or other sections of a book, the beginning and ending page numbers of the entire article or chapter are given. See also 15.23.

15.9 Author-date references—examples and variations. The examples that follow provide an overview of the author-date system, featuring books and journal articles as models. Each example includes a reference list entry and a corresponding text citation. For the sake of consistency, text citations are presented in parentheses, though they do not always appear that way in practice (see 15.28). For more examples, consult the sections dealing with specific types of works throughout this chapter.

Book with Single Author or Editor

For a book with a single author, invert the name in the reference list; in the text, include only the last name. Punctuate and capitalize as shown. To cite a specific passage, a page number or range is included in a text citation, separated from the year by a comma (a comma is also used between nonconsecutive page references). Page numbers are not included in a reference list unless the entry is for a chapter (see "Chapter in an Edited Book," below). See also 9.60-64.

Strayed, Cheryl. 2012. *Wild: From Lost to Found on the Pacific Crest Trail.* New York: Alfred A. Knopf.

(Strayed 2012, 87-88)

(Strayed 2012,261,265)

A book with an editor in place of an author includes the abbreviation *ed. (editor;* for more than one editor, use *eds.).* Note that the

text citation does not include *ed.*

Daum, Meghan, ed. 2015. *Selfish, Shallow, and Self-Absorbed: Sixteen Writers on the Decision Not to Have Kids.* New York: Picador.

(Daum 2015, 32)

Book with Multiple Authors

For a book with two authors, only the first-listed name is inverted in the reference list.

Grazer, Brian, and Charles Fishman. 2015. *A Curious Mind: The Secret to a Bigger Life.* New York: Simon & Schuster.

(Grazer and Fishman 2015,188)

For a book with three authors, adapt as follows:

Berkman, Alexander, Henry Bauer, and Carl Nold. 2011. *Prison Blossoms: Anarchist Voices from...*

(Berkman, Bauer, and Nold 2011,7-10)

For a book with four or more authors, include all the authors in the reference list entry (see also 14.76). Word order and punctuation are the same as for two or three authors. In the text, however, cite only the last name of the first-listed author, followed by *et al.* (see also 15.29).

(Hacek et al. 2015, 384)

Book with Author plus Editor or Translator

In the reference list, do not abbreviate *Edited by* or *Translated by.* See also 14.104.

Garcia Marquez, Gabriel. 1988. *Love in the Time of Cholera.* Translated by Edith Grossman. London: Cape.

(Garcia Marquez 1988, 242-55)

Chapter in an Edited Book

In citations of a chapter or similar part of an edited book, include the chapter author; the chapter title, in quotation marks; and the editor. Precede the title of the book with *In.* Note the location of the page range for the chapter in the reference list entry. See also 14.106-12.

Gould, Glenn. 1984. "Streisand as Schwarzkopf." In *The Glenn Gould Reader,* edited by Tim Page, 308-11. New York: Vintage Books.

(Gould 1984, 310)

Journal Article

Citations of journals typically include the volume and issue number and date of publication. The volume number follows the italicized journal title in roman and with no intervening punctuation. A specific page reference is included in the text; the page range for an article is included in the reference list, preceded by a colon. Authors should record the full information for the issue, including issue number, even if a journal is paginated consecutively across a volume or if the month or season appears with the year.

Bagley, Benjamin. 2015. "Loving Someone in Particular." *Ethics* 125, no. 2 (January): 477-507.

(Bagley 2015, 484-85)

The URL in the following example indicates that the article was consulted online; in this case, it is based on a DOI and is preferred to the URL that appears with the article (see 14.7, 14.8). Some publishers will use the URL as the basis of a link to the cited resource. For access dates (not shown here), see 14.176.

Liu, Jui-Ch'i. 2015. "Beholding the Feminine Sublime: Lee Miller's War Photography." *Signs* 40, no. 2 (Winter): 308-19. https://doi.org/10.1086/678242.

(Liu 2015, 312)

For the use of parentheses with issue numbers (as for a journal for which the month or season is unavailable or otherwise not listed), see 15.47. For the use of a colon with volume numbers (as for a journal for which only volume and year are listed), see 15.48.

Reference Lists and Text Citations

Reference Lists

15.10 Function and placement of reference lists. In the author-date system, the reference list is the prime vehicle for documentation. The text citations (see 15.21-31) are merely pointers to the full list. A reference list, like other types of bibliographies (see 14.64), is normally placed at the end of a work, preceding the index, if there is one. In a multiauthor book or a textbook (or any book to be offered in the form of individual chapters), each chapter is usually followed by its own reference list, in which case the list is preceded by a subhead such as References or Literature Cited. Journal articles are always treated this way.

15.11 Alphabetical arrangement of reference list entries. A reference list is arranged alphabetically (except in a numbered reference system; see 14.3) and should generally not be divided into sections. (Types of sources that are not readily adapted to author-date style are often better cited in notes; see, for example, 15.58-59.) All sources are listed by the last names of the authors (or, if no author or editor is given, by the title or, failing that, a descriptive phrase). Rules for alphabetizing an index (see 16.56-93) apply also to a reference list, with the modifications described in 14.66 and 15.17-20. For an illustration, see figure 15.1.

15.12 Authors' names in reference list entries. In a reference list as in a bibliography, record the authors' names as they appear on the title page or at the head of an article or chapter, with the exceptions noted in 14.72-84. Some publications, especially in the natural sciences, use initials rather than full given names (see 15.33). Where this practice is followed an exception should be made where two authors share the same initials and last name. For text citations, see 15.22.

15.13 Titles in reference list entries. Titles and subtitles of books, articles, and other works in reference lists should be treated according to the rules set forth in 14.85-99 and exemplified throughout chapter 14. It is recognized, however, that some publications—particularly journals in the natural sciences—generally prefer sentence-style capitalization for titles (see 8.158), tend not to use quotation marks or italics, and abbreviate journal titles (see 15.46).

15.14 Placement of dates in reference list entries. Because the text citations consist of the last name of the author or authors (or that of the editor or translator) and the year of publication, the year in the reference list appears directly after the name, not with the publication details. (When the date of publication includes month and day, the year may be repeated to avoid any confusion; for an example, see 15.49.) This arrangement facilitates easy lookup of reference list entries.

Pager, Devah, and David S. Pedulia. 2015. "Race, Self-Selection, and the Job Search Process." *American Journal ofSociology* 120, no. 4 (January): 1005-54. https://doi.org/10.1086/681072.

Unger, Roberto Mangabeira, and Lee Smolin. 2014. *The Singular Universe and the Reality of Time: A Proposal in Natural Philosophy.* Cambridge: Cambridge University Press.

For *n.d.* and the use of access dates for sources consulted online, see 15.44 and 15.50. See also 15.55.

15.15 Abbreviations in reference list entries. In reference lists, spell out such phrases as *edited by* or *translated by*, which are capitalized if following a period. On the other hand, noun forms such as *editor (ed.)* and *translator (trans.)* are always abbreviated, as are such standard bibliographic terms as *volume (vol.)*, number *(no.)*, and so forth. Abbreviations may be used with greater frequency as long as they are used consistently. For example, *University* may be abbreviated to *Univ.*, and months given with journal citations may be abbreviated (see 10.39). See also 15.33,15.46.

15.16 Single author versus several authors—reference list order. As in a bibliography (chapter 14), a single-author entry in a reference list precedes a multiauthor entry beginning with the same name. Only the first author's name is inverted. Successive entries by two or more authors in which only the first author's name is the same are alphabetized according to the coauthors' last names (regardless of how many coauthors there are).

Lamont, Michele. 2012. "Toward a Comparative Sociology of Valuation and Evaluation." *Annual Review of Sociology* 38 (August): 201-22. https://doi.org/10.1146/annurev-soc-070308-120022.

Lamont, Michele, and Nicolas Duvoux. 2014. "How Neo-liberalism Has Transformed France's Symbolic Boundaries?" *French Politics, Culture & Society* 32, no. 2 (Summer): 57-75. https://doi.org/10.3167/fpcs.2014.320208.

Lamont, Michele, Jason Kaufman, and Michael Moody. 2000. "The Best of the Brightest: Definitions of the Ideal Self among Prize-Winning Students." *Sociological Forum* 15, no. 2 (June): 187-224. http://www.jstor.org/stable/684814.

Lamont, Michele, and Ann Swidler. 2014. "Methodological Pluralism and the Possibilities and Limits of Interviewing." *Qualitative Sociology* 37, no. 2 (June): 153-71. https://doi.org/10.1007/slll33-014-9274-z.

The 3-Em Dash for Repeated Names in a Reference List

15.17 The 3-em dash in reference lists—some caveats. The advice in this section, which explains how to use the 3-em dash to stand in for repeated reference list entries under the same name, is aimed primarily at publishers and editors. Authors usually should not use the 3-em dash for repeated names in their manuscripts. Among other potential pitfalls, 3-em dashes do not work in computerized sorts (i.e., all entries with 3-em dashes will line up in one place). Moreover, an incorrectly applied dash may obscure an important detail—for example, the abbreviation *ed.* or *trans.* Publishers, too, may decide not to apply 3-em dashes: 3-em dashes make it impractical to present entries outside the context of the list (e.g., in a pop-up box or when linking directly from in-text citation to reference list entry) and can hide entries from bibliographic databases, both of which are concerns for electronic publication formats. Where 3-em dashes are not used, simply repeat author name(s) and sort the entries as described throughout this

section. See also 6.94.

15.18 Chronological order for repeated names in a reference list. For successive entries by the same author(s), translator(s), editor(s), or compiler^), a 3-em dash replaces the name(s) after the first appearance (but see 15.17). The entries are arranged chronologically by year of publication in ascending order, *not* alphabetized by title (as in a bibliography; see 14.71). Undated works designated *n.d.* or *forthcoming follow* all dated works (see 15.44-45).

Schuman, Howard, and Jacqueline Scott. 1987. "Problems in the Use of Survey Questions to Measure Public Opinion." *Science* 236 (4804): 957-59. https://doi .org/10.1126/science.236.4804.957.

------. 1989. "Generations and Collective Memories." *American Sociological Review* 54, no. 3 (June): 359-81. http://www.jstor.org/stable/2095611.

Note that the 3-em dash *cannot* stand in for the same two or more authors as in the previous entry if they appear in a different order. The following two entries are alphabetized as if they are by two different sets of authors (i.e., "jean" comes before "John"):

Comaroff, Jean, and John Comaroff, eds. 1993. *Modernity and Its Malcontents: Ritual and Power in Postcolonial Africa.* Chicago: University of Chicago Press.

Comaroff, John, and Jean Comaroff. 1991-97. *Of Revelation and Revolution. 2* vols. Chicago: University of Chicago Press.

15.19 The 3-em dash with edited, translated, or compiled works. The 3-em dash replaces the preceding name or names only, not an added *ed., trans., comp.,* or whatever. The chronological order is maintained, regardless of the added abbreviation.

Woodward, David. 1977. *The All-American Map: Wax Engraving and Its Influence on Cartography.* Chicago: University of Chicago Press.

------, ed. 1987. *Art and Cartography: Six Historical Essays.* Chicago: University of

Chicago Press.

------. 1996. *Catalogue ofWatermarks in Italian Printed Maps, ca. 1540-1600.* Chicago: University of Chicago Press.

Woodward is the author of the first and third items, editor of the second.

15.20 Reference list entries with same author(s), same year. Two or more works by the same author in the same year must be differentiated by the addition of *a, b,* and so forth (regardless of whether they were authored, edited, compiled, or translated) and are listed alphabetically by title. Text citations consist of author and year plus letter.

Fogel, Robert William. 2004a. *The Escape from Hunger and Premature Death, 1700-2100: Europe, America, and the Third World.* New York: Cambridge University Press.

------. 2004b. "Technophysio Evolution and the Measurement of Economic Growth." *Journal of Evolutionary Economics* 14, no. 2 (June): 217-21. https://doi.org/10.1007/s00191-004-0188-x.

(Fogel 2004b, 218) (Fogel 2004a, 45-46)

When works by the same two or more authors list their names in a different order, then *a, b,* and so forth cannot be used. See 15.18.

Text Citations

15.21 Agreement of text citation and reference list entry. For each author-date citation in the text, there must be a corresponding entry in the reference list under the same name and date. It is the author's responsibility to ensure such agreement as well as the accuracy of the reference (see 2.32). Among other things, specific page references to a journal article, when given in a text citation, must fall within the range of pages given for the article in the reference list entry. Manuscript editors can help authors by cross-checking text citations and reference lists and rectifying or querying any discrepancies or omissions (see 2.63).

15.22 Text citations—basic form. An author-date citation in running text or at the end of a block quotation usually consists of the last (family) name of the author, followed by the year of publication of the work in question. In this context, *author* may refer not only to one or more authors or an institution but also to one or more editors, translators, or compilers. No punctuation appears between author and date. Abbreviations such as *ed,* or *trans,* are omitted. See also 15.23.

Text citations:

(Hetherington and Rudolph 2015) (Grove 2015)

References:

Grove, John. "Calhoun and Conservative Reform." 2015. *American Political Thought* 4, no. 2 (March): 203-27. https://doi.org/10.1086/680389.

Hetherington, Marc J., and Thomas J. Rudolph. 2015. *Why Washington Wont Work: Polarization, Political Trust, and the Governing Crisis.* Chicago: University of Chicago Press.

To refer to two or more sources in the same text citation, separate the sources with semicolons (but see 15.30).

(Hetherington and Rudolph 2015; Grove 2015)

Where two or more works by different authors with the same last name are listed in a reference list, the text citation must include an initial (or two initials or a given name if necessary).

Text citations:

(C. Doershuk 2017) (J. Doershuk 2016)

References:

Doershuk, Carl. 2017**...** Doershuk, John. 2016....

15.23 Page and volume numbers or other specific locators in text citations. When a specific page, section, equation, or other division of the work is cited, it follows the date, preceded by a comma. When a volume as a whole is referred to, without a page number, *vol.* is used. For volume plus page, only a colon is needed. The *n* in the Fischer and Siple example below indicates "note" (see 14.157). The last example shows one strategy for citing a specific location (e.g., a section heading) in a work that contains no page or section numbers or other numerical signposts—the case for some electronic formats (see 14.160).

(Piaget 1980,74)

(LaFree 2010, 413, 417-18)

(Claussen 2015, para. 2.15) *or* (Claussen 2015, II 2.15)

(Johnson 1979, sec. 24) *or* (Johnson 1979, § 24)

(Fowler and Hoyle 1965, eq. 87)

(Hsu 2017, chap. 4)

(Garcia 1987, vol. 2)

(Garcia 1987, 2:345)

(Barnes 1998, 2:354-55, 3:29)

(Fischer and Siple 1990,212n3)

(Hellman 2017, under "The Battleground")

Some journals omit page numbers in citations of other journal articles except when citing a direct quotation.

15.24 Additional material in text citations. The parentheses that enclose a text citation may also include a comment, separated from the citation by a semicolon (see also 15.30).

(Mandolan 2017; t-tests are used here)

15.25 Text citations in relation to surrounding text and punctuation. Except at the end of block quotations (see 15.26), author-date citations are usually placed just before a mark of punctuation though need not be if the sentence would otherwise not require it. See also 15.28.

Recent literature has examined long-run price drifts following initial public offerings (Ritter 1991; Loughran and Ritter 1995), stock splits (Ikenberry, Rankine, and Stice 1996), seasoned equity offerings (Loughran and Ritter 1995), and equity repurchases (Ikenberry, Lakonishok, and Vermaelen 1995).

but

There is evidence, for example, that the negative outcomes associated with family structure instability are more pronounced for young children as compared with older children (Sigle-Rushton and McLanahan 2004) and for boys as compared with girls (Cooper et al. 2011).

Where the author's name appears in the text, it need not be repeated in the parenthetical citation. Note that the date should immediately follow the author's name, even if the name is used in the possessive. This usage serves the logic and economy of the author-date style. (For a reference to a person rather than the work, it may be appropriate to include the given name on first mention.)

Fiorina et al. (2005) and Fischer and Hout (2006) reach more or less the same conclusions. In contrast, Abramowitz and Saunders (2005) suggest that the mass public is deeply divided between red states and blue states and between churchgoers and secular voters. Tufte's (2001) excellent book on chart design warns against a common error.

15.26 Text citations in relation to direct quotations. Although a source citation normally follows a direct quotation, it may precede the quotation— especially if such a placement allows the date to appear with the author's name.

As Edward Tufte points out, "A graphical element may carry data information and also perform a design function usually left to non-data-ink" (2001,139).

or

As Edward Tufte (2001,139) points out, "A graphical element may carry data information and also perform a design function usually left to non-data-ink."

When the source of a block quotation is given in parentheses at the end of the quotation, the opening parenthesis appears *after the* final punctuation mark of the quoted material. No period either precedes or follows the closing parenthesis.

If you happen to be fishing, and you get a strike, and whatever it is starts off with the preliminaries of a vigorous fight; and by and by, looking down over the side through the glassy water, you see a rosy golden gleam, the mere specter of a fish, shining below in the clear depths; and when you look again a sort of glory of golden light flashes and dazzles as it circles nearer beneath and around and under the boat;. . . and you land a slim and graceful and impossibly beautiful three-foot goldfish, whose fierce and vivid yellow is touched around the edges with a violent red—when all these things happen to you, fortunate but bewildered fisherman, then you may know you have been fishing in the Galapagos Islands and have taken a Golden Grouper. (Pinchot 1930,123)

See also 13.70-72.

15.27 Several references to the same source. When the same page (or page range) in the same source is cited more than once in one paragraph, the parenthetical citation can be placed after the last reference or at the end of the paragraph (but preceding the final period). When referring to different pages in the same source, however, include a full parenthetical citation at the first reference; subsequent citations need only include page numbers.

Complexion figures prominently in Morgan's descriptions. When Jasper compliments his mother's choice of car (a twelve-cylinder Mediterranean roadster with leather and wood-grained interior), "his cheeks blotch indignantly, painted by jealousy and rage" (Chaston 2000, 47). On the other hand, his mother's mask never changes, her "even-tanned good looks" (56), "burnished visage" (101), and "air-brushed confidence" (211) providing the foil to the drama in her midst.

15.28 Syntactic considerations with text citations. An author-date citation is a form of bibliographic shorthand that corresponds to a fully cited work; it does not refer to a person. Note how, in the examples in 15.25 and 15.26, the wording distinguishes between authors and works. A locution such as "in Smith 2009," though technically proper, is usually best avoided except as part of a parenthetical citation. To help readers identify the source citation, prefer "in Smith (2009)" or, for example, "in Smith's (1999) study." Note that square brackets should be used in parenthetical text references that require additional parentheses, as in the second example (see 6.101).

There are at least three works that satisfy the criteria outlined in Smith's (1999) study (see Rowen 2006; Bettelthorp 2004a; Choi 2008).

These processes have, in turn, affected the way many Latin Americans are treated in the United States (see, e.g., Haviland [2003, 767] on how US courts disregard the existence of indigenous languages and "reluctantly" make allowance only for Spanish in translation services).

15.29 Text citations of works with more than three authors. For more than three authors (or in some science publications, more than two), only the name of the first author is used, followed by *et al.* (and others). Note that *et al.* is not italicized in text citations.

(Schonen et al. 2017)

According to the data collected by Schonen et al. (2017)),..

If a reference list includes another work of the same date that would also be abbreviated as "Schonen et al." but whose coauthors are different persons or listed in a different order, the text citations must distinguish between them. In such cases, the first two authors (or the first three) should be cited, followed by *et al.*

(Schonen, Baker, et al. 2017) (Schonen, Brooks, et al. 2017)

Alternatively, a shortened title, enclosed in commas, may be added. In the following examples, *et al.* refers to different coauthors, so *a*, *b*, and so on cannot be used (see 15.20):

(Schonen et al., "Tilting at Windmills," 2017)

(Schonen et al., "Gasoline Farmers," 2017)

For treatment of multiple authors in a bibliography or reference list, see 14.76,15.9 (under "Book with Multiple Authors"), 15.16.

15.30 Multiple text references. Two or more references in a single parenthetical citation are separated by semicolons. The order in which they are given may depend on what is being cited, and in what order, or it may reflect the relative importance of the items cited. If neither criterion applies, alphabetical or chronological order may be appropriate. Unless the order is prescribed by a particular journal style, the decision is the author's.

(Armstrong and Malacinski 1989; Beigl 1989; Pickett and White 1985)

Additional works by the same author(s) are cited by date only, separated by commas except where page numbers are required.

(Whittaker 1967,1975; Wiens 1989a, 1989b)

(Wong 1999, 328; 2000, 475; Garcia 1998, 67)

Additional references prefaced by "see also" follow any other references (see also 15.24).
(Guest et al. 2006; see also Stolle et al. 2008; Rahn et al. 2009)

15.31 **Author-date system with notes.** Where footnotes or endnotes are used to supplement the author-date system, source citations within notes are treated in the same way as in text (see fig. 15.2).

1. James Wilson has noted that "no politician ever lost votes by denouncing the bureaucracy" (1989, 235). Yet little is actually ever done to bring major reforms to the system.

For the use of notes with legal-style citations, see 15.58. For more on footnotes and endnotes, see 14.24-60.

Figure 15.2. A sample of text with both parenthetical text citations and a footnote. See 15.31.

Author-Date References: Special Cases

15.32 Items not necessarily covered in chapter 14. The majority of examples in chapter 14 can be adapted to the author-date system simply by moving the year of publication to follow the author's name (see 15.3). This section focuses on special cases not necessarily covered there or for which a suitable author-date form may not be apparent.

Author's Name

15.33 Publications preferring initials for authors' names. The reference lists in some publications, especially journals in the natural sciences, always use initials instead of given names. When periods are used, space appears between them (Wells, H. G.); when periods are omitted, as in some journals' styles, no comma intervenes between last name and initials, and no space appears between the initials (Wells HG). Chicago recommends using the form of the name as it appears with the source unless otherwise required.

15.34 Author-date format for anonymous works (no listed author). If the author, editor, translator, or the like for the work is unknown, the reference list entry should normally begin with the title. An initial article is ignored in alphabetizing. Text citations may refer to a short form of the title but must include the first word (other than an initial article). See also 15.37, 15.39,15.49,14.79.

Stanze in lode della donna brutta. 1547. Florence.

A True and Sincere Declaration of the Purpose and Ends of the Plantation Begun in Virginia, of the Degrees Which It Hath Received, and Means by Which It Hath Been Advanced. 1610. London.

(True and Sincere Declaration 1610)

(Stanze in lode della donna brutta 1547) *or (Stanze* 1547)

As in notes and bibliographies, bracket a name in reference lists and text citations if the authorship is known or guessed at but was omitted on the title page (use a question mark to indicate uncertainty). (Note that in the Hawkes example, both New York and Tea Party are hyphenated in the original source.)

[Hawkes, James?]. 1834. *A Retrospect of the Boston Tea-Party, with a Memoir of George R. T. Hewes.* By a Citizen of New-York. New-York.

[Horsley, Samuel]. 1796. *On the Prosodies of the Greek and Latin Languages.* London.

([Horsley] 1796) ([Hawkes?] 1834)

Works explicitly attributed to "Anonymous" (e.g. on the title page or at the head of the work) should be cited accordingly.

Anonymous. 2015. "Our Family Secrets." *Annals of Internal Medicine* 163, no. 4 (August): 321. https://doi.org/10.7326/M14-2168.

(Anonymous 2015)

15.35 Pseudonyms in author-date references. Pseudonyms are indicated in reference lists in exactly the same manner as they are in bibliographies (see 14.80,14.81). Text citations should refer to the first-listed name and will omit the indication *pseud.*

Centinel [pseud.]. 1981. Letters. In *The Complete Anti-Federalist*, edited by Herbert J. Storing. Chicago: University of Chicago Press.

Stendhal [Marie-Henri Beyle]. 1925. *The Charterhouse of Parma.* Translated by C. K. Scott-Moncrieff. New York: Boni and Liveright.

(Stendhal 1925) (Centinel 1981)

See also 14.82. For examples of screen names in author-date references, see 15.52.

15.36 Editor in place of author in text citations. For works listed by editor(s) or compiler(s) or translator(s) in a reference list, abbreviations such as *ed.* or *eds.*, *comp*, or *comps.*, or *trans*, following the name are omitted in text citations.

Silverstein, Theodore, trans. 1974. *Sir Gawain and the Green Knight.* Chicago: University of Chicago Press.

Soltes, Ori Z., ed. 1999. *Georgia: Art and Civilization through the Ages.* London: Philip Wilson.

(Silverstein 1974) (Soltes 1999)

15.37 Organization as author in author-date references. If a publication issued by an organization, association, or corporation carries no personal author's name on the title page, the organization may be listed as author in the reference list, even if it is also given as publisher. To facilitate shorter parenthetical text citations, the organization may be listed under an abbreviation, in which case the entry must be alphabetized under that abbreviation (rather than the spelled-out name) in the reference list.

ISO (International Organization for Standardization). 1997. *Information and Documentation—Rules for the Abbreviation of Title Words and Titles of Publications.* ISO 4:1997. Paris: ISO.

NISO (National Information Standards Organization). 2010. *Bibliographic References.* ANSI/NISO Z39.29-2005. Bethesda, MD: NISO, approved June 9, 2005; reaffirmed May 13,2010.

(NISO 2010) (ISO 1997)

See also 15.55,14.259.

Title of Work

15.38 Publications preferring sentence-style capitalization for titles. Especially in the natural sciences, many publications that use a version of the author-date style prefer sentence-style capitalization for cited titles (except, usually, the titles of journals, which are often abbreviated; see 15.46). In sentence style, only the first word in a title or a subtitle and any proper names are capitalized (see 8.158). Some publications do not capitalize the first word in a subtitle unless it is a proper noun. Works that prefer this style also may not use quotation marks for chapter or article titles or italics for titles of books (and sometimes journals). (Such usage is normally limited to reference lists; in the text, the use of headline-style capitalization, quotation marks, and italics for titles is the norm for English-language publications.) Though Chicago recommends headline style and the use of quotation marks or italics in both its systems of documentation, these forms can be readily adapted to other, sparer systems.

15.39 Citing author-date sources by title. Works for which no author is credited or can be determined (including any organization or publisher as author; see 15.37,15.49) are listed by title in a reference list entry. In the text, a short version of the title (up to four words) may be used. Unlike short forms for titles in notes and bibliography style (see 14.33), short forms for in-text references must include the first word of the title (aside from any article) to facilitate alphabetical lookup. For examples, see 15.34.

Books

EDITION, VOLUME, OR COLLECTION

15.40 Reprint editions and modern editions—more than one date. When citing a reprint or modern edition in the author-date system, it is sometimes desirable to include the original date of publication. Whether or not any information about the original publication is included, the original date is listed first, in parentheses. If the pagination of the original edition does not match that of the reprint, indicate the edition cited.

Austen, Jane. (1813) 2003. *Pride and Prejudice.* London: T. Egerton. Reprint, New York: Penguin Classics. Citations refer to the Penguin edition.

Darwin, Charles. (1859) 1964. *On the Origin of Species.* Facsimile of the first edition, with an introduction by Ernest Mayr. Cambridge, MA: Harvard University Press.

Maitland, Frederic W. (1898) 1998. *Roman Canon Law in the Church of England.* Reprint, Union, NJ: Lawbook Exchange.

The parentheses are rendered as square brackets in the in-text citation (see 6.101).

(Austen [1813] 2003) (Darwin [1859] 1964) (Maitland [1898] 1998)

For more than one work by the same author, the first date determines placement in the reference list (see 15.18).

Maitland, Frederic W. (1898) 1998. *Roman Canon Law in the Church of England.*

Reprint, Union, NJ: Lawbook Exchange. ------. (1909) 1926. *Equity, Also the Forms of Action at Common Law: Two Coursesof Lectures.* Edited by A. H. Chaytor and W. J. Whittaker. Reprint, Cambridge: Cambridge University Press.

When the original date is less important to the discussion, use the date of the modern source. The date of original publication may be included at the end of the reference list entry but need not be.

Trollope, Anthony. 1977. *The Claverings.* With a new introduction by Norman

Donaldson. New York: Dover. First published 1866-67. ------. 1983. *He Knew He Was Right. 2* vols. in one. New York: Dover. First published 1869.

(Trollope 1977) (Trollope 1983)

15.41 Multivolume works published over more than one year. When a multi-volume, multiyear work is included as an entry in the reference list (as in the Tillich example below), the range of dates for the work as a whole follows the author's name. The corresponding text citation should include a volume number with any references to specific page numbers or to cite a specific volume (see also 15.23). When an individual volume is listed (as in the Hayek example), the date for that volume should follow the name of the author; information about the work as a whole follows information about the individual volume. If the work has not yet been completed, the date of the first volume is followed by an en dash (with no space between the en dash and the punctuation that follows). Text citations of volumes listed individually in the reference list do *not* include the volume number, even with references to

specific page numbers. See also 14.116-22. For en dashes with numbers, see 6.78,6.79,9.64.

Hayek, F. A. 2011. *The Constitution of Liberty: The Definitive Edition.* Edited by Ronald Hamowy. Vol. 17 of *The Collected Works ofF. A. Hayek,* edited by Bruce Caldwell. Chicago: University of Chicago Press, 1988-.

Tillich, Paul. 1951-63. *Systematic Theology.* 3 vols. Chicago: University of Chicago Press.

(Tillich 1951-63,1:133) (Tillich 1951-63, vol. 2) (Hayek 2011, 329)

15.42 Cross-references to multiauthor books in reference lists. To avoid repeating information, individual contributions to an edited volume may include cross-references to an entry for the volume as a whole. Note that cross-references to other titles in the reference list take the form of text citations but without any parentheses.

Draper, Joan E. 1987. "Paris by the Lake: Sources of Bumham's Plan of Chicago." In Zukowsky 1987,107-19.

Harrington, Elaine. 1987. "International Influences on Henry Hobson Richardson's Glessner House." In Zukowsky 1987,189-207.

Zukowsky, John, ed. 1987. *Chicago Architecture, 1872-1922: Birth of a Metropolis.* Munich: Prestel-Verlag in association with the Art Institute of Chicago.

This approach is best used only if more than a few individual contributions to the same volume are cited or if the volume itself is also cited in the text. Otherwise, include full publication details in the entry for each individual contribution. See also 14.107.

Draper, Joan E. 1987. "Paris by the Lake: Sources of Bumham's Plan of Chicago." In *Chicago Architecture, 1872-1922: Birth of a Metropolis,* edited by John Zukowsky, 107-19. Munich: Prestel-Verlag in association with the Art Institute of Chicago.

15.43 Author-date style for letters in published collections. In the author-date system, letters in published collections should be cited by the date of the collection. The dates of individual correspondence should be woven into the text. The material in the examples at 14.111 could be cited as follows:

Adams, Henry. 1930. *Letters of Henry Adams, 1858-1891.* Edited by Worthington

Chauncey Ford. Boston: Houghton Mifflin. White, E. B. 1976. *Letters ofE. B. White.* Edited by Dorothy Lobrano Guth. New York: Harper & Row.

In a letter to Charles Milnes Gaskell from London, March 30,1868 (Adams 1930, 141), Adams wrote ...

White (1976, 273) sent Ross an interoffice memo on May 2,1946, pointing out that...

FACTS OF PUBLICATION

15.44 No date of publication in author-date references. When the publication date of a book or other work cannot be ascertained, the abbreviation *n.d.* takes the place of the year in the reference list entry and text citations. Though it follows a period in the reference list, *n.d.* remains lowercased to avoid conflation with the author's name; in text citations, it is preceded by a comma. A guessed-at date may be substituted (in brackets, with a question mark to indicate uncertainty). See also 14.132,15.18.

Nano, Jasmine L. [1750?]. *Title of Work...* ------. n.d. *Title of Another Work...*

(Nano [1750?]) (Nano, n.d.)

For the use of *n.d.* for website content cited by access date, see 15.50. See also 15.54.

15.45 "Forthcoming" in author-date references. Like *n.d.* (see 15.44), *forthcoming can* stand in place of the date in author-date references. It should be reserved for books under contract with a publisher and already titled but for which the date of publication is not yet known. If page numbers are available, they should be given as needed. Books not under contract are treated as unpublished manuscripts (see 14.216). In text citations, *forthcoming* is preceded by a comma. See also 14.146.

Faraday, Carry. Forthcoming. "Protean Photography." In *Seven Trips beyond the Asteroid Belt,* edited by James Oring. Cape Canaveral, FL: Launch Press.

(Faraday, forthcoming)

Periodicals

15.46 Publications preferring abbreviations for journal titles. In many publications in the sciences, journal titles are abbreviated (often with periods omitted) unless they consist of only one word. ISO 4, a standard developed by the International Organization for Standardization, is the main authority for abbreviations of words in serial titles (bibliog. 4.7). Standard abbreviations for scientific journals may also be found in *BIOSIS Serial Sources* and through the NLM Catalog, a service of the US National Library of Medicine, among other resources (bibliog. 4.5). For more detailed information, including lists of additional resources, see the latest edition of *Scientific Style and Format* or the *AMA Manual of Style* (bibliog. 1.1).

15.47 Parentheses or comma with issue number. Though authors are encouraged to record all available data for their manuscripts (see 15.9, under "Journal Article"), sometimes only a volume and issue number will be available (and in some cases, it may be a publisher's preferred style not to record a month or season). When that is the case, the issue number is placed in parentheses. When only an issue number is used, it is set offby commas and not enclosed in parentheses. Compare 15.48.

Glass, Jennifer, and Philip Levchak. 2014. "Red States, Blue States, and Divorce: Understanding the Impact of Conservative Protestantism on Regional Variation in Divorce Rates." *American lournal of Sociology* 119 (4): 1002-46. https:// doi.org/10.1086/674703.

Meyerovitch, Eva. 1959. "The Gnostic Manuscripts of Upper Egypt." *Diogenes,* no. 25, 84-117.

15.48 Colon with volume number. Authors are encouraged to record all available data for their manuscripts (see 15.9, under "Journal Article"). Sometimes, however, there is no issue number, or it may be intentionally omitted (usually according to a publisher's preferred style), either for a reference to a journal that is paginated continuously throughout a volume or when a month or season is included. When there is no issue number, and where no month or season is recorded, the page number reference follows the volume number, separated by a colon and with no intervening space. If the month or season is included, it is enclosed in parentheses, and a space follows the colon. Compare 15.47.

Gunderson, Alex R., and Manuel Leal. 2015. "Patterns of Thermal Constraint on Ectotherm Activity." *American Naturalist* 185:653-64. https://doi.org/10.1086/680849. *but* Gunderson, Alex R., and Manuel Leal. 2015. "Patterns of Thermal Constraint on

Ectotherm Activity." *American Naturalist* 185 (May): 653-64. https://doi.org/10.1086/680849.

15.49 Newspapers and magazines in reference lists. It is usually sufficient to cite newspaper and magazines articles entirely within the text—a strategy that is identical in form in both systems of citation. See 14.198. If a reference list entry is needed, repeat the year of publication with the month and day to avoid any confusion.

Kauffman, Stanley. 1989. Review of A *Dry White Season* (film), directed by Euzhan Paley. *New Republic,* October 9,1989,24-25.

Meikle, James. 2015. "Nearly 75% of Men and 65% of Women in UK to Be Overweight by 2030—Study." *Guardian* (UK edition), May 5,2015. http://www.the guardian.com/society/2015/may/05/obesity-crisis-projections-uk-2030-men -women.

If a newspaper article is unsigned, the title of the newspaper stands in place of the author.

New York Times. 2002. "In Texas, Ad Heats Up Race for Governor." July 30,2002.

(New York Times 2002)

See also 15.34,15.37.

Websites, Blogs, and Social Media

15.50 Websites and access dates in author-date format. Chicago requires an access date in citations of websites and other sources consulted online only if no date of publication or revision can be determined from the source (see 14.12). In those cases—that is, when only an access date is used—record *n.d.* as the date of publication in the reference list entry and for the in-text citation. To avoid conflation with the name of the author, *n.d.* is always lowercase (see also 15.44).

Alliance for Linguistic Diversity, n.d. "Balkan Romani." Endangered Languages.

Accessed April 6,2016. http://www.endangeredlanguages.com/lang/5342. CivicPlus Content Management System, n.d. City of Ithaca, New York (website).

Accessed April 6,2016. http://www.cityofithaca.org/.

(Alliance for Linguistic Diversity, n.d.) (CivicPlus, n.d.)

For sources that include a date of publication or revision, use the year of publication in the reference list entry. Repeat the year with the month and day to avoid any confusion.

Google. 2016. "Privacy Policy." Privacy & Terms. Last modified March 25,2016. http://www.google.com/policies/privacy/.

(Google 2016)

See also 15.37.

15.51 Citing blogs in author-date format. Blogs and blog posts are cited in author-date format by adapting the recommendations outlined in 14.208. It is often sufficient to cite blog posts, like newspaper and magazine articles, entirely within the text (see 15.49). If a reference list entry is needed, repeat the year of publication with the month and day to avoid any confusion.

Germano, William. 2014. "Futurist Shock." *Lingua Franca* (blog), *Chronicle of Higher Education.* February 15, 2017. http://www.chronicle.com/blogs/lingua franca/2017/02/15/futurist-shock/.

(Germano 2017)

Comments are not included in reference lists; instead, they should be cited in the text, in reference to the related post.

A comment on Germano (2017) from WordObsessed (on March 15,2017) insisted that...

References to an entire blog should likewise be made in the text rather than in a reference list. The URL can be listed in parentheses.

Lingua Franca, a blog published by the *Chronicle of Higher Education* (http://www .chronicle.com/blogs/linguafranca/)...

For the use of screen names in author-date format, see 15.52.

15.52 Citing social media content in author-date format. Social media content can be cited in author-date format by adapting the recommendations outlined and exemplified in 14.209. Like citations for text messages and other personal communications (see 15.53), citations of social media content can often be limited to the text. A frequently cited account or an extensive thread related to a single subject or post, however, may be included in a reference list. In the reference list, include the real name and a screen name, if both are available. In the text, cite the name under which the entry is listed (usually the real name unless only a screen name is available). Repeat the year with the month and day in the reference list to avoid any confusion. See also 15.35.

Chicago Manual of Style. 2015. "Is the world ready for singular they? We thought so back in 1993." Facebook, April 17,2015. https://www.facebook.com/Chicago Manual/posts/10152906193679151.

Diaz, Junot. 2016. "Always surprises my students when I tell them that the 'real' medieval was more diverse than the fake ones most of us consume." Face-book, February 24, 2016. https://www.facebook.com/junotdiaz.writer/posts /972495572815454.

O'Brien, Conan (@ConanOBrien). 2015. "In honor of Earth Day, I'm recycling my tweets." Twitter, April 22, 2015,11:10 a.m. https://twitter.com/ConanOBrien /status/590940792967016448.

Souza, Pete (@petesouza). 2016. "President Obama bids farewell to President Xi of China at the conclusion of the Nuclear Security Summit." Instagram photo, April 1,2016. https://www.instagram.eom/p/BDrmfXTtNCt/.

(Chicago Manual of Style 2015)

(Diaz 2016)

(O'Brien 2015)

(Souza 2016)

Comments are cited only in the text, in reference to the related post.

Michele Truty agreed, saying that "we do need a gender-neutral pronoun" (April 17, 2015, comment on Chicago Manual of Style 2015).

Direct or private messages shared through social media and received by the author are cited as personal communications (see 15.53).

Interviews and Personal Communications

15.53 Unpublished interviews and personal communications. In a parenthetical citation, the terms *personal communication* (or *pers. comm.), unpublished data,* and the like may be used after the name(s) of the per-son(s) concerned, following a comma. If the medium is important and not mentioned in the text, it may be incorporated into the parenthetical reference. Reference list entries are unneeded, though each person cited must be fully identified elsewhere in the text. Initials may be used for first names. Unless it is mentioned in the text, a date should be added in parentheses, following a comma. The abbreviation *et al.* should be avoided in such citations.

(Julie Cantor, pers. comm.)

(Jonathan Lee, Facebook direct message to author, May 5,2017)

(Brenda Hasbrouck, text message to author, May 5,2017)

(A. P. Moller, unpublished data; C. R. Brown and M. B. Brown, unpublished data)

Manuscript Collections

15.54 Manuscript collections in author-date format. When citing manuscript collections in author-date format, it is unnecessary to use *n.d.* (no date) in place of the date. Dates of individual items should be mentioned in the text, when applicable.

Egmont Manuscripts. Phillipps Collection. University of Georgia Library. Kallen, Horace. Papers. YIVO Institute for Jewish Research, New York.

Oglethorpe wrote to the trustees on January 13,1733 (Egmont Manuscripts), to say...

Alvin Johnson, in a memorandum prepared sometime in 1937 (Kallen Papers, file 36), observed that...

If only one item from a collection has been mentioned in the text, however, the entry may begin with the writer's name (if known). In such a case, the use *of n.d.* may be appropriate. See also 15.44.

Dinkel, Joseph, n.d. Description of Louis Agassiz written at the request of Elizabeth Cary Agassiz. Agassiz Papers. Houghton Library, Harvard University.

(Dinkel, n.d.)

Patents and Standards

15.55 Patents or other documents cited by more than one date. Cite patents and other documents that include more than one date as follows (note that the year of issue is repeated to avoid ambiguity):

Iizuka, Masanori, and Hideki Tanaka. 1986. Cement admixture. US Patent 4,586,960, filed June 26,1984, and issued May 6,1986.

For examples of standards cited in author-date format, see 15.37.

Citations Taken from Secondary Sources

15.56 "Quoted in" in author-date references. To cite a source from a secondary source ("quoted in__") is generally to be discouraged since authors are expected to have examined the works they cite. If an original source is unavailable, however, mention the original author and date in the text, and cite the secondary source in the reference list entry.

Costello, Bonnie. 1981. *Marianne Moore: Imaginary Possessions.* Cambridge, MA: Harvard University Press.

In Louis Zukofsky's "Sincerity and Objectification," from the February 1931 issue *of Poetry* magazine (quoted in Costello 1981)..

Audiovisual Recordings and Other Multimedia

15.57 Citing recordings and multimedia in author-date format. Audiovisual recordings and other multimedia can be cited in author-date format by adapting the recommendations and examples outlined and exemplified in 14.261-68. (In many cases, however, it will be more appropriate to list such materials in running text and group them in a separate section or discography; see 14.262.) Older sources on outdated media are more likely to be consulted in the form of a digital copy; though authors should cite the format consulted, it is generally useful to give information about the original source, if available. Moreover, the date of the original recording should be privileged in the citation. Whom to list as "author" depends on the focus of the citation and is a matter of authorial discretion.

Coolidge, Calvin. [1920?]. "Equal Rights" (speech). In "American Leaders Speak: Recordings from World War I and the 1920 Election, 1918-1920." Library of Congress. Copy of an undated 78 rpm disc, RealAudio and WAV formats, 3:45. http://memory.loc.gov/ammem/nfhtml/.

Grande, Lance, and Allison Augustyn. 2011. *Gems and Jewels.* iPad ed., v. 1.01. Touchpress. Adapted from Lance Grande and Allison Augustyn, *Gems and Gemstones: Timeless Natural Beauty of the Mineral World* (Chicago: University of Chicago Press, 2009).

Holiday, Billie, vocalist. 1958. "I'm a Fool to Want You." By Joel Herron, Frank Sinatra, and Jack Wolf. Recorded February 20,1958, with Ray Ellis. Track 1 on *Lady in Satin.* Columbia CL1157, *33⅓* rpm.

Lyiscott, Jamila. 2014. "3 Ways to Speak English." Filmed February 2014 in New York, NY. TED video, 4:29. https://www.ted.com/talks/jamila_lyiscott_3_ways tospeakenglish.

Pink Floyd. 1970. *Atom Heart Mother.* Capitol CDP 7 463812,1990, compact disc.

Rihanna [Robin Fenty], vocalist. 2007. "Umbrella." Featuring Jay-Z. MP3 audio. Track 1 on Rihanna, *Good Girl Gone Bad.* Island Def Jam.

Rovio Entertainment. 2014. *Angry Birds Transformers.* V. 1.4.25. Rovio Entertainment. Android 4.0 or later. Soundtrack by Vince DiCola and Kenny Meriedeth.

Strayed, Cheryl. 2012. *Wild: From Lost to Found on the Pacific Crest Trail.* Read by Bernadette Dunne. New York: Random House Audio. Audible audio ed., 13 hr., 6 min.

Weingartner, Felix von, conductor. 1936.*150 Jahre Wiener Philharmoniker.* Prei-ser Records PR90113 (mono), 1992, compact disc. Includes Beethoven's Symphony no. 3 in E-flat Major and Symphony no. 8 in F Major.

(Coolidge [1920?])	(Rihanna 2007)
(Grande and Augustyn 2011)	(Rovio Entertainment 2014)
(Holiday 1958)	(Strayed 2012)
(Lyiscott 2014)	(Weingartner 1936) (Pink Floyd 1970, track 2)

Live performances, which cannot be consulted as such by readers, are generally not cited in a reference list. Instead, incorporate the details about the performance into the text. See also 14.266.

In a performance of Lin-Manuel Miranda's *Hamilton* at the Richard Rodgers Theatre in New York on February 2,2016,...

Legal and Public Documents

15.58 Using notes for legal and public documents. Legal publications use notes for documentation and few include bibliographies. Any work using the author-date style that needs to do more than mention the occasional source in the text should therefore use supplementary footnotes or endnotes; see 15.31. This advice does not extend to documents that are collected in secondary sources or published as freestanding works (see 14.291), since these are readily adaptable to the author-date system (see 15.3). For a full discussion of legal and public documents, including examples, see 14.269-305.

15.59 Citing legal and public documents in text. Works with only a handful of citations to legal and public documents may be able to limit these to the text, using the forms detailed in 14.269-305. Note that in legal style, parentheses within parentheses are used (see also 6.97).

In *NLRB v. Somerville Construction Co.* (206 F.3d 752 (7th Cir. 2000)), the court ruled that...

In the *Congressional Record* for that day (147 Cong. Rec. 19,000 (2001)), Senator Burns is quoted as saying that...

In order to avoid such awkward constructions in the text, however, Chicago advises using notes for citations to legal and public documents whenever possible (see 14.271).

Author–Date References: Special Cases

The journal applies the **Chicago Manual of Style, 17th edition, Author–Date system**. Although Chicago allows certain stylistic variants, **only the forms explicitly defined below are permitted**. Any deviation is considered a citation error (Chicago 17, §§14.4, 15.5).

Digital Object Identifiers (DOI)

When a DOI is available, it must be included in the reference list. The journal uses **only the DOI in the form of a full URL**, in accordance with Chicago Manual of Style recommendations (Chicago 17, §§14.6–14.8).

Only the following format is permitted:
https://doi.org/10.xxxx/xxxx

Other DOI formats (e.g. "doi:", "doi.org/…", mixed formats, or DOIs containing spaces) are not allowed.

Chicago permits DOIs to be presented either as a URL or in DOI format; however, it explicitly requires **consistency within a publication** and recommends DOI-based URLs as the preferred and most stable form (Chicago 17, §§14.4, 14.8).

Correct:
https://doi.org/10.1086/678242

Incorrect:
doi:10.1086/678242 doi.org/10.1086/678242 https:// doi.org /10.1086/678242

Capitalization of Titles (Uppercase / Lowercase)

Titles in the reference list must be capitalized according to the language of the source:

- English-language titles: headline-style capitalization
- Titles in other languages: capitalization according to the conventions of that language (sentence-style, where applicable)

(Chicago 17, §§8.159, 14.87, 15.38)
Titles of journals must be written consistently and identically throughout the reference list.

Chicago explicitly states that capitalization rules depend on the language of the title and prohibits arbitrary or mixed capitalization within the same reference list (Chicago 17, §§8.159, 14.4).

Correct (English):
"Beholding the Feminine Sublime: Lee Miller's War Photography."

Correct (Serbian):
"Uticaj digitalizacije na mala i srednja preduzeća"

Incorrect:
"Uticaj Digitalizacije Na Mala I Srednja Preduzeća"

Capitalization of Journal Titles

Titles of journals in the reference list must be capitalized according to the language in which the journal is published and must be written consistently and identically in all references.

- English-language journal titles: headline-style capitalization
- Journal titles in other languages: capitalization according to the conventions of that language (sentence-style, where applicable)

(Chicago 17, §§8.159, 14.87, 14.170, 15.13)

Chicago treats journal titles as titles of larger works and requires that they follow the capitalization rules of the language of publication. Arbitrary variation in capitalization of the same journal title within a reference list is not permitted (Chicago 17, §§14.4, 14.170).

Correct (English journal title):
Signs
Journal of Economic Perspectives
International Journal of Tourism Research

Correct (Serbian journal title):
Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu
Ekonomske teme
Industrija

Incorrect (mixed or arbitrary capitalization):
Zbornik Radova Ekonomskog Fakulteta u Istočnom Sarajevu
ZBORNIK RADOVA EKONOMSKOG FAKULTETA U ISTOČNOM SARAJEVU
Journal Of Economic Perspectives
Journal of economic perspectives

Spacing in Volume and Issue Numbers

Journal volume and issue numbers must be formatted with a space before the issue number in parentheses:
Volume (Issue)
(Chicago 17, §§14.171, 15.47)

Explanation.
Chicago treats spacing as a formal bibliographic element. Inconsistent spacing is considered a formatting error and must be avoided (Chicago 17, §§14.4, 14.171).

Correct:
Journal of Economics 9 (2): 115–132.

Incorrect:
Journal of Economics 9(2): 115–132.

Pagination and Page Ranges

Page ranges must be indicated using an **en dash (–)**, not a hyphen (-), and without additional spaces.
(Chicago 17, §§6.78–6.83, 14.148)
Chicago clearly distinguishes between hyphens and en dashes. The en dash is mandatory for numeric ranges, including page numbers (Chicago 17, §6.80).

Correct:
115–132
Incorrect:
115-132
115 - 132

Quotation Marks

A single quotation mark style must be used consistently throughout the manuscript and reference list.

- Double quotation marks (“ ”) are used for article and chapter titles.
- Single quotation marks (‘ ’) are used only for quotations within quotations.

(Chicago 17, §§6.9–6.11, 14.86)

Chicago allows no random variation in quotation mark usage. Consistency across all references is mandatory (Chicago 17, §14.4).

General Principle of Consistency

Although the Chicago Manual of Style allows certain stylistic variants, journal publications require strict adherence to a single, clearly defined citation standard. All references must conform to the rules and examples provided in these Instructions for Authors (Chicago 17, §§14.4, 15.5).

Conference Proceedings (Institutional Volumes)

Papers published in conference proceedings without explicitly listed individual editors (institutional proceedings) are cited as contributions in an institutional proceedings volume. The title of the proceedings is treated as the title of the larger work. Editors are omitted unless explicitly stated in the publication.

Depending on data availability, references to conference papers may include DOI or a stable web link, but only according to the standardized cases defined below.
(Chicago Manual of Style, 17th ed., §§14.84, 14.127, 14.170, 15.3)
Session titles (e.g. *Plenary Session*, *General Session*) are not included in reference list entries.

Chicago permits flexible adaptation of book- and chapter-style references for institutional publications and conference proceedings. When no individual editors are identified, the organizing institution is listed as the publisher, and the proceedings title functions as the container title.
Identifiers such as ISSN, DOI, or URLs may be included when available, but must not be mixed arbitrarily and must follow a consistent, journal-defined order.
(Chicago 17, §§14.4, 14.84, 14.127, 15.5)

Conference paper without DOI, or web link

Iida, Yasuhiro, Bojan Mrazovac, and Yasuo Ishigure. 2025."Label Entropy with Similarity Graph Clique for Assessing Annotation Quality." In *Proceedings of the Jahorina Business Forum* 2025. Pale: Faculty of Economics, University of East Sarajevo.

Conference paper with DOI

Iida, Yasuhiro, Bojan Mrazovac, and Yasuo Ishigure. 2025. "Label Entropy with Similarity Graph Clique for Assessing Annotation Quality." In *Proceedings of the Jahorina Business Forum* 2025.
Pale: Faculty of Economics, University of East Sarajevo. https://doi.org/10.7251/ZJF2514259I

Conference paper with web link (no DOI)

Iida, Yasuhiro, Bojan Mrazovac, and Yasuo Ishigure. 2025. "Label Entropy with Similarity Graph Clique for Assessing Annotation Quality." In *Proceedings of the Jahorina Business Forum* 2025. Pale: Faculty of Economics, University of East Sarajevo. https://doisrpska.nub.rs/index.php/ZJPF/article/view/12437/11929

General Consistency Requirement

When multiple identifiers are available (DOI or URL), the DOI takes precedence. Web links are used only when a DOI is not available. Identifiers must be presented in a uniform order and format across all references. (Chicago 17, §§14.6–14.8, 15.4)

The author receives a copy of the journal in which his/her paper was published. Only those papers that are written in accordance with the above guidelines will be sent for review. For reviewers, the papers are anonymous.

Visit us

http://www.zrefis.ekofis.ues.rs.ba

zrefis.ekofis.ues.rs.ba

ISSN 1840-3557